

# CHEMISTRY, B.S. (BEHREND)

**Begin Campus:** Any Penn State Campus

**End Campus:** Erie

## Program Description

This major is professionally approved by the American Chemical Society and provides a strong foundation in chemistry while preparing students for graduate or professional programs as well as for careers with companies and agencies requiring chemistry or related areas. The major provides students the opportunity to choose an area of specialization to meet their career goals as well as participate in undergraduate research with faculty members and/or industrial internships.

## What is Chemistry?

Chemistry is the study of matter and its transformations. Chemists seek a molecular-level understanding of the ways in which atoms combine to form molecules and bulk materials, how molecular structure and interactions lead to macroscopic material properties, and how chemical transformations can be used to create useful materials and store energy. Research in chemistry intersects a variety of other fields including biology, physics, environmental science, geology, material science, medicine, and more.

## You Might Like This Program If...

- You are curious about the world around you. How and why does it look, sound, smell, taste, and feel the way it does? What are objects composed of? Why do substances react the way they do?
- You find both theoretical and hands-on laboratory learning appealing.
- You enjoy the challenge of problem-solving.
- You are interested in working with instrumentation and making precise measurements.
- You want to study in an American Chemical Society-approved degree program.

## Entrance to Major

In order to be eligible for entrance to the CHMBC major (all options), a student must have: 1) attained at least 29.1 credits; and 2) earned at least a 2.00 cumulative grade-point average.

## Degree Requirements

**For the Bachelor of Science degree in Chemistry, a minimum of 124 credits is required:**

Requirement	Credits
General Education	45
Requirements for the Major	97

**18-24 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses.**

Per Senate Policy 83.80.5, the college dean or campus chancellor and program faculty may require up to 24 credits of coursework in the major to be taken at the location or in the college or program where the degree is earned.

## Requirements for the Major

Each student must earn at least a grade of C in each 300- and 400-level course in the major field.

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
<b>Prescribed Courses</b>		
<i>Prescribed Courses: Require a grade of C or better</i>		
BIOL 110	Biology: Basic Concepts and Biodiversity	4
CHEM 110	Chemical Principles I	3
CHEM 111	Experimental Chemistry I	1
CHEM 112	Chemical Principles II	3
CHEM 113	Experimental Chemistry II	1
CHEM 210	Organic Chemistry I	3
CHEM 212	Organic Chemistry II	3
CHEM 213	Laboratory in Organic Chemistry	2
CHEM 227	Analytical Chemistry	4
CHEM 358	Literature, Conduct and Safety in the Chemical Sciences	3
CHEM 413	Chemistry of the Elements	4
CHEM 431W	Organic and Inorganic Preparations	4
CHEM 440	Instrumental Analysis	3
CHEM 441	Instrumental Analysis Laboratory	1
CHEM 450	Physical Chemistry - Thermodynamics	3
CHEM 451	Experimental Physical Chemistry I	1
CHEM 452	Physical Chemistry - Quantum Chemistry	3
CHEM 453	Experimental Physical Chemistry II	1
CHEM 472	General Biochemistry I	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MATH 230	Calculus and Vector Analysis	4
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4
<b>Additional Courses</b>		
<i>Additional Courses: Require a grade of C or better</i>		
Select 3 credits from the following:		3
BMB 402	General Biochemistry	
MATH 250	Ordinary Differential Equations	
STAT 401	Experimental Methods	
Select 3 credits from the following:		3
CHEM 494	Chemical Research	
CHEM 495	Internship	
CHEM 496	Independent Studies	
Select 6 credits of 400-level CHEM courses (excluding CHEM 494, CHEM 495, and CHEM 496)		6
<b>Supporting Courses and Related Areas</b>		
Select 12 credits from school approved list. <sup>1</sup>		12

<sup>1</sup> Students may apply up to 6 credits of ROTC.

## General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (<https://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/>) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

### Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

### Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

### Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

### Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

## University Degree Requirements

### First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

### Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

### Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

### Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

### Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

### Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

## Program Learning Objectives

- **Chemical Literature:** The student will acquire a foundation of chemistry of sufficient breadth and depth to enable them to critically interpret the primary chemical literature.
- **Collaboration:** The student will develop and ability to function effectively on a team, whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- **Communication:** The student will develop the ability to effectively communicate scientific information and research results in written and oral formats with a diverse range of audiences.
- **Ethics:** The student will develop an ability to recognize ethical and professional responsibilities in scientific situations and make informed judgements, which must consider the impact of chemical processes in global, economic, environmental, and societal contexts.
- **Experiment Design:** The student will learn the laboratory skills needed to design, safely conduct and interpret chemical experiments and will learn proper ways of disposing of chemical waste.
- **Integrate Knowledge:** The student will understand the interdisciplinary nature of chemistry and will develop an ability to integrate knowledge of mathematics, physics and other disciplines to a wide variety of chemical and environmental problems.
- **Periodic Table:** The student will understand the importance of the Periodic Table of the Elements, how it came to be, and its role in organizing chemical information, and its relationship to the natural world and natural resources.

## Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of

both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

## Erie

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## Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2023-24 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition (*Note: the archive only contains suggested academic plans beginning with the 2018-19 edition of the Undergraduate Bulletin*).

## Professional Chemist Concentration: Chemistry, B.S. at Erie Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

### First Year

Fall	Credits	Spring	Credits
PSU 7	1	CHEM 112*	3
CHEM 110*	3	CHEM 113*	1
CHEM 111*	1	MATH 141**†	4
MATH 140**†	4	PHYS 211*†	4
BIOL 110**†	4	General Education Course or ENGL 15‡	3
ENGL 15 (or General Education Course)‡	3	General Education Course	1.5
<b>16</b>		<b>16.5</b>	

### Second Year

Fall	Credits	Spring	Credits
CHEM 210*	3	CHEM 212*	3
CHEM 227*	4	CHEM 213*	2
MATH 230*	4	MATH 250 or STAT 401* <sup>1</sup>	3
PHYS 212*†	4	ENGL 202C††	3

General Education Course	1.5	General Education Course	3
<b>16.5</b>		<b>14</b>	

### Third Year

Fall	Credits	Spring	Credits
CHEM 358*	3	CHEM 440*	3
CHEM 450*	3	BMB 402* <sup>1</sup>	3
CHEM 451*	1	CHEM 441*	1
CHEM 472*	3	CHEM 452*	3
CAS 100‡	3	CHEM 453*	1
General Education Course	3	CHEM 494 or 495*	1
		Supporting Course	3
<b>16</b>		<b>15</b>	

### Fourth Year

Fall	Credits	Spring	Credits
CHEM 413*	4	CHEM 431W*	4
400-Level Chemistry Elective*	3	400-Level Chemistry Elective*	3
CHEM 494 or 495*	1	CHEM 494 or 495*	1
General Education Course	3	General Education Course	3
Supporting Course	3	Supporting Course	3
General Education Course	3		
<b>17</b>		<b>14</b>	

### Total Credits 125

- \* Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

<sup>1</sup> 3-credits from BMB 402, MATH 250 or STAT 401 are required. Additional credits from this will be used as a supporting course.

### University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

### Program Notes:

- **Supporting Course List:** Students must take 12 credits of courses that are appropriate for a science major and on the school approved list. These include but are not limited to:
  - Additional 300- or 400-level chemistry courses beyond those required including up to 3 credits of CHEM 494/CHEM 495
  - BIOL 220W or higher
  - BMB 251 or higher

- CMPEN
- CMPSC 121 or higher
- EDSGN 100S
- ENVSC 200-level or higher
- GEOG 100-level or higher
- GEOSC 100-level or higher
- Language courses 001-003 (e.g., CHNS, FR, GER, SPAN)
- MATH 200-level or higher
- MICRB 201 or higher
- PHYS 213, PHYS 214, PHYS 237, or any 400-level
- PLET 205 or higher
- SOILS 100-level or higher
- STAT 250 or higher
- SWENG

## Biochemistry Concentration: Chemistry, B.S. at Erie Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

### First Year

Fall	Credits Spring	Credits
PSU 7	1 CHEM 112*	3
CHEM 110*	3 CHEM 113*	1
CHEM 111*	1 MATH 141**†	4
MATH 140**†	4 BIOL 230W	4
BIOL 110**†	4 General Education Course or ENGL 15‡	3
ENGL 15 (or General Education Course)‡	3 General Education Course	1.5
	<b>16</b>	<b>16.5</b>

### Second Year

Fall	Credits Spring	Credits
CHEM 210*	3 CHEM 212*	3
CHEM 227*	4 CHEM 213*	2
MATH 230*	4 PHYS 212**†	4
PHYS 211**†	4 ENGL 202C**†	3
General Education Course (GHW)	1.5 General Education Course	3
	<b>16.5</b>	<b>15</b>

### Third Year

Fall	Credits Spring	Credits
CHEM 358*	3 CHEM 440*	3
CHEM 450*	3 CHEM 441*	1
CHEM 451*	1 CHEM 452*	3
CHEM 472*	3 CHEM 453*	1
CAS 100‡	3 CHEM 494 or 495*	1
BIOL 322	3 BMB 402*	3
	BMB 403	1
	General Education Course	3
	<b>16</b>	<b>16</b>

### Fourth Year

Fall	Credits Spring	Credits
CHEM 413*	4 CHEM 431W*	4
400-Level Chemistry Elective*	3 400-Level Chemistry Elective*	3
CHEM 494 or 495*	1 CHEM 494 or 495*	1
General Education Course	3 General Education Course	3
BMB 406, BIOL 416, or MICRB 201	3 Supporting Course	3
General Education Course	3	
	<b>17</b>	<b>14</b>

**Total Credits 127**

- \* Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

### University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

### Program Notes:

- The CHMBC degree requires MATH 250, STAT 401, or BMB 402 and 12 credits of Supporting Courses. For a student interested in a concentration in Biochemistry, they are advised to take BMB 402, BMB 403, BIOL 230W, BIOL 322, BMB 406 or BIOL 416 or MICRB 201, plus one additional Supporting Course of their choice to fulfill these requirements.
- Students who choose to take either BIOL 220W or BIOL 230W as their additional supporting course will qualify for a minor in biology.
- **Supporting Course List:** Students must take 12 credits of courses that are appropriate for a science major and on the school approved list. These include but are not limited to:
  - Additional 300- or 400-level chemistry courses beyond those required including up to 3 credits of CHEM 494/CHEM 495
  - BIOL 220W or higher
  - BMB 251 or higher
  - CMPEN
  - CMPSC 121 or higher
  - EDSGN 100S
  - ENVSC 200-level or higher
  - GEOG 100-level or higher
  - GEOSC 100-level or higher
  - Language courses 001-003 (e.g., CHNS, FR, GER, SPAN)
  - MATH 200-level or higher
  - MICRB 201 or higher
  - PHYS 213, PHYS 214, PHYS 237, or any 400-level
  - PLET 205 or higher
  - SOILS 100-level or higher
  - STAT 250 or higher
  - SWENG

## Environmental Concentration: Chemistry, B.S. at Erie Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

### First Year

Fall	Credits Spring	Credits
PSU 7	1 CHEM 112*	3
CHEM 110*	3 CHEM 113*	1
CHEM 111*	1 MATH 141**†	4
MATH 140**†	4 PHYS 211**	4
BIOL 110**†	4 General Education Course (GA/GH/GS) or ENGL 15‡	3
ENGL 15 (or General Education Course (GA/GH/GS))‡	3 General Education Course (GHW)	1.5
	<b>16</b>	<b>16.5</b>

### Second Year

Fall	Credits Spring	Credits
CHEM 210*	3 CHEM 212*	3
CHEM 227*	4 CHEM 213*	2
MATH 230*	4 PHYS 212**†	4
BIOL 220W	4 ENGL 202C**†	3
General Education Course (GA/GH/GS)	3 STAT 401	3
	<b>18</b>	<b>15</b>

### Third Year

Fall	Credits Spring	Credits
CHEM 358*	3 CHEM 440*	3
CHEM 450*	3 CHEM 441*	1
CHEM 451*	1 CHEM 452*	3
CHEM 472*	3 CHEM 453*	1
MICRB 201	3 CHEM 494 or 495*	1
MICRB 202	2 CAS 100‡	3
	General Education Course (GA/GH/GS)	3
	<b>15</b>	<b>15</b>

### Fourth Year

Fall	Credits Spring	Credits
CHEM 413*	4 CHEM 431W*	4
400-Level Chemistry Elective*	3 400-Level Chemistry Elective*	3
CHEM 494 or 495*	1 CHEM 494 or 495*	1
General Education Course (GA/GH/GS) or CHEM 301	3 GEOSC 418	3
General Education Course (GA/GH/GS)	3 General Education Course (GA/GH/GS)	3

General Education Course (GA/GH/GS)	3 General Education Course (GHW)	1.5
	<b>17</b>	<b>15.5</b>

### Total Credits 128

- \* Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

### University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

### Program Notes:

- The CHMBC degree requires MATH 250, STAT 401, or BMB 402 and 12 credits of Supporting Courses. For a student interested in an Environmental Concentration, they are advised to take STAT 401, BIOL 220W, MICRB 201, MICRB 202, CHEM 301 or CHEM 297 (Biogeochemistry, which does not yet have a permanent course number) and GEOSC 418 to fulfill these requirements.
- **Supporting Course List:** Students must take 12 credits of courses that are appropriate for a science major and on the school approved list. These include but are not limited to:
  - Additional 300- or 400-level chemistry courses beyond those required including up to 3 credits of CHEM 494/CHEM 495
  - BIOL 220W or higher
  - BMB 251 or higher
  - CMPEN
  - CMPSC 121 or higher
  - EDSGN 100S
  - ENVSC 200-level or higher
  - GEOG 100-level or higher
  - GEOSC 100-level or higher
  - Language courses 001-003 (e.g., CHNS, FR, GER, SPAN)
  - MATH 200-level or higher
  - MICRB 201 or higher
  - PHYS 213, PHYS 214, PHYS 237, or any 400-level
  - PLET 205 or higher
  - SOILS 100-level or higher
  - STAT 250 or higher
  - SWENG

## Pre-Health Concentration: Chemistry, B.S. at Erie Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

### First Year

Fall	Credits Spring	Credits
PSU 7	1 CHEM 112*	3
CHEM 110*	3 CHEM 113*	1
CHEM 111*	1 MATH 141**†	4
MATH 140**†	4 BIOL 230W	4
BIOL 110**†	4 General Education Course (GA/GH/GS) or ENGL 15‡	3
ENGL 15 (or General Education Course (GA/GH/GS))‡	3 NUTR 251	3
	<b>16</b>	<b>18</b>

### Second Year

Fall	Credits Spring	Credits
CHEM 210*	3 CHEM 212*	3
CHEM 227*	4 CHEM 213*	2
MATH 230*	4 PHYS 211**†	4
BIOL 240W	4 ENGL 202C**†	3
SC 201	1 PSYCH 100 or SOC 1 (GS)	3
	<b>16</b>	<b>15</b>

### Third Year

Fall	Credits Spring	Credits
CHEM 358*	3 CHEM 440*	3
CHEM 450*	3 CHEM 441*	1
CHEM 451*	1 CHEM 452*	3
CHEM 472*	3 CHEM 453*	1
CAS 100‡	3 CHEM 494 or 495*	1
PHYS 212**†	4 BMB 402*	3
	BIOL 472	3
	<b>17</b>	<b>15</b>

### Fourth Year

Fall	Credits Spring	Credits
CHEM 413*	4 CHEM 431W*	4
400-Level Chemistry Elective*	3 400-Level Chemistry Elective*	3
CHEM 494 or 495*	1 CHEM 494 or 495*	1
BIOL 497 or MICRB 201	3-4 General Education Course (GA/GH/GS)	3
General Education Course (GA/GH/GS)	3 General Education Course (GA/GH/GS)	3
General Education Course (GA/GH/GS)	3	
	<b>17-18</b>	<b>14</b>

**Total Credits 128-129**

- \* Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

### University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

### Program Notes:

- The CHMBC degree requires MATH 250, STAT 401, or BMB 402 and 12 credits of Supporting Courses. For a student interested in a concentration in Pre-Health, they are advised to take BMB 402, BIOL 230W, BIOL 240W, BIOL 472, and either BIOL 497 (if interested in medical profession) or MICRB 201 (if interested in pharmacy) to fulfill these requirements. A student interested in attending medical school should consider taking MICRB 201 in addition to BIOL 497 and are advised to discuss this with their adviser. Students will qualify for a minor in biology with these courses.
- Students interested in pre-health careers are advised to take either PSYCH 100 and/or SOC 1 in order to fulfill the GS general education requirement and NUTR 251 to fulfill the GHW general education requirement.
- **Supporting Course List:** Students must take 12 credits of courses that are appropriate for a science major and on the school approved list. These include but are not limited to:
  - Additional 300- or 400-level chemistry courses beyond those required including up to 3 credits of CHEM 494/CHEM 495
  - BIOL 220W or higher
  - BMB 251 or higher
  - CMPEN
  - CMPSC 121 or higher
  - EDSGN 100S
  - ENVSC 200-level or higher
  - GEOG 100-level or higher
  - GEOSC 100-level or higher
  - Language courses 001-003 (e.g., CHNS, FR, GER, SPAN)
  - MATH 200-level or higher
  - MICRB 201 or higher
  - PHYS 213, PHYS 214, PHYS 237, or any 400-level
  - PLET 205 or higher
  - SOILS 100-level or higher
  - STAT 250 or higher
  - SWENG



## all options: Chemistry, B.S. at commonwealth Campuses

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

### First Year

Fall	Credits Spring	Credits
First Year Seminar	1 CHEM 112*	3
CHEM 110*	3 CHEM 113*	1
CHEM 111*	1 MATH 141**†	4
MATH 140**†	4 PHYS 211**†	4
BIOL 110**†	4 ENGL 15 (or General Education Course)†	3
ENGL 15 (or General Education Course)†	3 General Education Course	1.5
<b>16</b>		<b>16.5</b>

### Second Year

Fall	Credits Spring	Credits
CHEM 210*	3 CHEM 212*	3
CAS 100†	3 CHEM 213*	2
MATH 230*	4 MATH 250 or STAT 401 <sup>1</sup>	3
PHYS 212**†	4 ENGL 202C††	3
General Education Course	1.5 General Education Course	3
<b>15.5</b>		<b>14</b>

### Third Year

Fall	Credits Spring	Credits
CHEM 227*	4 CHEM 440*	3
CHEM 358*	3 CHEM 441*	1
CHEM 450*	3 CHEM 452*	3
CHEM 451*	1 CHEM 453*	1
General Education Course	3 CHEM 494 or 495*	1
General Education Course	3 BMB 402**†	3
	Supporting Course	3
<b>17</b>		<b>15</b>

### Fourth Year

Fall	Credits Spring	Credits
CHEM 413*	4 CHEM 431W*	4
CHEM 472*	3 400-Level Chemistry Elective*	3
CHEM 494 or 495*	1 CHEM 494 or 495*	1
General Education Course	3 General Education Course	3
Supporting Course	3 Supporting Course	3
400-Level Chemistry Elective*	3	
<b>17</b>		<b>14</b>

**Total Credits 125**

\* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

# Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

<sup>1</sup> 3 credits from BMB 402, MATH 250 or STAT 401 are required. Additional credits from this list will be used as a supporting course.

### University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

### Program Notes:

- **Supporting Course List:** Students must take 12 credits of courses that are appropriate for a science major and on the school approved list. These include but are not limited to:
  - Additional 300- or 400-level chemistry courses beyond those required including up to 3 credits of CHEM 494/CHEM 495
  - BIOL 220W or higher
  - BMB 251 or higher
  - CMPEN
  - CMPSC 121 or higher
  - EDSGN 100S
  - ENVSC 200-level or higher
  - GEOG 100-level or higher
  - GEOSC 100-level or higher
  - Language courses 001 – 003 (e.g., CHNS, FR, GER, SPAN)
  - MATH 200-level or higher
  - MICRB 201 or higher
  - PHYS 213, PHYS 214, PHYS 237, or any 400-level
  - PLET 205 or higher
  - SOILS 100-level or higher
  - STAT 250 or higher
  - SWENG

## Career Paths

Chemistry is called “the central science” for good reason—it is an incredibly versatile field of study that directly impacts other scientific fields. To help you tailor your degree to your career interests, Penn State Behrend offers four options for study with the degree program: General Chemistry, Biochemistry, Business, and Education. Penn State Behrend has a comprehensive support system to help you identify and achieve your goals for college and beyond. Meet with your academic adviser often and take advantage of the services offered by the Academic and Career Planning Center beginning in your first semester.

## Careers

Chemistry offers a wealth of career options in medicine, energy, industry, consumer goods, materials, academia, and government service. Penn State Behrend's B.S. in Chemistry graduates currently work as research scientists, product development scientists, field scientists, physicians, pharmacists, consultants, university professors, technical managers, and quality engineers. They are employed at organizations that include NASA, LORD Corporation, PPG, Hero BX, Associated Clinical Laboratories, and Pyramid Laboratories.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE CHEMISTRY PROGRAM (<https://behrend.psu.edu/school-of-science/academic-programs/chemistry/>)

## Opportunities for Graduate Studies

Chemistry is a foundational major for graduate study in specialized sub-disciplines such as biochemistry, toxicology, forensic chemistry, environmental chemistry, materials science, nanotechnology, pharmaceutical synthesis, polymer science, and chemical engineering. Chemistry also is a useful undergraduate major for future doctors, veterinarians, physician assistants, and other health care professionals. Penn State Behrend's B.S. in Chemistry graduates have pursued advanced degrees at universities and colleges across the nation, including University of Michigan, Princeton University, Case Western Reserve University, University of California Irvine, North Carolina State University, University of Maryland, University of Kansas, and Lake Erie College of Osteopathic Medicine, among others.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://behrend.psu.edu/school-of-science/academic-programs/chemistry/>)

## Professional Resources

- American Chemical Society (<https://www.acs.org>)
- The Royal Society of Chemistry (<https://www.rsc.org>)
- American Society for Biochemistry and Molecular Biology (<https://www.asbmb.org>)
- World Association of Theoretical and Computational Chemists (<https://watoc.net>)

## Contact

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