

# BACHELOR OF ARTS IN CHEMISTRY 4+1 MS CHEMISTRY TRACK

The Division of Chemistry within the Department of Chemical and Biological Sciences is comprised of 14 full-time faculty, 10 adjunct & part time faculty, 3 staff members, nearly 100 majors in its BS & BA Chemistry and BS Biochemistry programs, and an active MS program. The division is exceptionally well-equipped in research instrumentation, and offers a rich, hands-on 'learning through research' experience for its students. State-of-the-art laboratory facilities include NMR, X-ray diffraction (powder and single crystal), electron microscopy (scanning & transmission), and a variety of analytical instrumentation. As part of the College of STEM, the division also participates in the YSU Ph.D. program in Materials Science and Engineering.

Our BS Chemistry program is accredited by the American Chemical Society (ACS), one of the largest scientific societies in the world. Students completing an accredited program are considered to be especially well-trained for the chemistry profession, thus the BS degree is recommended for those students who plan to make a career in industrial chemistry or pursue a graduate degree in chemistry. The BA degree is recommended for those who plan to go into a medical, pharmacy, or dental field and for those who plan to enter business or secondary education careers related to chemistry. The BS Biochemistry degree integrates the chemical and biological sciences for students interested in developing a deep understanding of the molecular and chemical processes of living organisms. Students completing this program will be especially well-prepared for further studies in medicine or graduate school programs in biochemistry, or for related careers in the chemical industry.

Each student majoring in chemistry or biochemistry will be assigned a faculty advisor by the department. The advisor will discuss the overall curriculum necessary for your degree program and will assist you in the preparation of a suitable course sequence and choice of a minor or minors if applicable.

COURSE	TITLE	S.H.
<b>FIRST YEAR REQUIREMENT -STUDENT SUCCESS</b>		
YSU 1500	Success Seminar	1-2
or YSU 1500S	Youngstown State University Success Seminar	
or HONR 1500	Intro to Honors	
<b>General Education Requirements</b>		
ENGL 1550	Writing 1	3-4
or ENGL 1549	Writing 1 with Support	
ENGL 1551	Writing 2	3
Mathematics requirement (met with MATH in major)		
Some courses are categorized in more than one knowledge domain. Courses can only be used once within the GE model.		
Arts and Humanities (6 s.h.)		6
Natural Sciences (2 courses, 1 with lab) (6-7 s.h.)		
Requirement is met through science courses in the major		
Social Science (6 s.h.)		6
<b>General Education Electives (9 s.h.)</b>		
CMST 1545	Communication Foundations	3
Any 2 Gen Ed Courses (6 s.h.)		6
<b>Foreign Language</b>		
FNLG 1501	Conversational Foreign Language 1	3
FNLG 1502	Conversational Foreign Language 2	3
<b>The following CHEM core courses are required (29 s.h.):</b>		
Grade of "C" or better is required. Courses cannot be taken "CR/NC"		
CHEM 1515	General Chemistry 1	3
CHEM 1515L	General Chemistry 1 Laboratory	1

CHEM 1515R	Recitation for General Chemistry 1	1
CHEM 1516	General Chemistry 2	3
CHEM 1516L	General Chemistry 2 Laboratory	1
CHEM 1516R	Recitation for General Chemistry 2	1
CHEM 2604 & 2604L	Quantitative Analysis and Quantitative Analysis Laboratory	5
CHEM 3719	Organic Chemistry 1	3
CHEM 3719L	Organic Chemistry 1 Laboratory	1
CHEM 3719R	Organic Chemistry Recitation 1	1
CHEM 3720	Organic Chemistry 2	3
CHEM 3720L	Organic Chemistry 2 Laboratory	1
CHEM 3720R	Organic Chemistry Recitation 2	1
CHEM 3739	Physical Chemistry 1	3
CHEM 3739L	Physical Chemistry 1 Laboratory	1

#### The following capstone is required (1 s.h.):

CHEM 4850	Chemistry Research	1
-----------	--------------------	---

#### The following non-CHEM courses are required (18 s.h.):

MATH 1571	Calculus 1	4
MATH 1572	Calculus 2	4
PHYS 2610	General Physics 1	4
PHYS 2610L	General Physics Laboratory 1	1
PHYS 2611	General Physics 2	4
PHYS 2611L	General Physics laboratory 2	1

#### Dual Credit Requirements

Select 9 s.h. of upper-level CHEM electives from the list below: 9

CHEM 5822 & 5822L	Advanced Organic Laboratory and Advanced Organic Laboratory	
CHEM 5804 & 5804L	Chemical Instrumentation and Chemical Instrumentation Laboratory	
CHEM 6911	Advanced Analytical Chemistry 1	
CHEM 6912	Advanced Analytical Chemistry 2	
CHEM 6921	Advanced Biochemistry 1	
CHEM 6941	Advanced Organic Chemistry 1	
CHEM 6980	Introduction to Chemical Research	
CHEM 6991K	Special Topics Organometallics	
CHEM 6991Q	Special Topics Quantum Chemistry	

29 s.h. of additional electives required, 15 s.h. of which must be upper level. These electives should include courses needed to fulfill requirements of the minor, which is required.

**Total Semester Hours 128-130**

#### Dual Credit Requirements

#### Accelerated 4+1 Program

Undergraduate Chemistry students can apply for admission into the accelerated 4+1 MS in Chemistry graduate program after completing 78 undergraduate semester hours with a GPA of 3.0 or higher. After being admitted to the accelerated 4+1 MS program, students will be allowed a maximum of nine semester hours of graduate coursework, specified as 5000 level or higher, to be double counted toward both a bachelor's and master's degrees. The courses chosen to count for both undergraduate and graduate coursework must be approved by the Graduate Program Director. An additional three hours of graduate coursework can be completed as an undergraduate and used exclusively for graduate credit. This allows the student to graduate with a master's degree with one year of additional full-time study beyond the bachelor's degree, as the total hours counted towards the Master's degree is greater than or equal to 30 hours.

#### Courses Counting Towards Requirements

Select 3 of these courses, as only 3 can be double counted. Can select a 4th that would only count for the Master's degree.

**Year 1**

		S.H.
<b>Fall</b>		
YSU 1500 or YSU 1500S or HONR 1500	Success Seminar or Youngstown State University Success Seminar or Intro to Honors	1-2
CHEM 1515	General Chemistry 1	3
CHEM 1515L	General Chemistry 1 Laboratory	1
CHEM 1515R	Recitation for General Chemistry 1	1
MATH 1571	Calculus 1	4
ENGL 1550 or ENGL 1549	Writing 1 or Writing 1 with Support	3-4
<b>Semester Hours</b>		<b>13-15</b>

**Spring**

CHEM 1516	General Chemistry 2	3
CHEM 1516L	General Chemistry 2 Laboratory	1
CHEM 1516R	Recitation for General Chemistry 2	1
MATH 1572	Calculus 2	4
ENGL 1551	Writing 2	3
Gen Ed SS		3
<b>Semester Hours</b>		<b>15</b>

**Year 2**

		S.H.
<b>Fall</b>		
CHEM 3719	Organic Chemistry 1	3
CHEM 3719L	Organic Chemistry 1 Laboratory	1
CHEM 3719R	Organic Chemistry Recitation 1	1
CHEM 2604 & 2604L	Quantitative Analysis and Quantitative Analysis Laboratory	5
PHYS 2610 & 2610L	General Physics 1 and General Physics Laboratory 1	5
<b>Semester Hours</b>		<b>15</b>

**Spring**

CHEM 3720	Organic Chemistry 2	3
CHEM 3720L	Organic Chemistry 2 Laboratory	1
CHEM 3720R	Organic Chemistry Recitation 2	1
PHYS 2611 & 2611L	General Physics 2 and General Physics laboratory 2	5
Gen Ed SS		6
<b>Semester Hours</b>		<b>16</b>

**Year 3**

		S.H.
<b>Fall</b>		
CHEM 3739	Physical Chemistry 1	3
CHEM 3739L	Physical Chemistry 1 Laboratory	1
FNLG 1501	Conversational Foreign Language 1	3
Gen Ed AH		3
Gen Ed AH		3
Elective		4
<b>Semester Hours</b>		<b>17</b>

**Spring**

FNLG 1502	Conversational Foreign Language 2	3
Upper-Level Chemistry Elective		3
Upper-Level Electives		5
Gen Ed Elective		3
<b>Semester Hours</b>		<b>14</b>

**Year 4****Fall**

CHEM 4850	Chemistry Research	1
CMST 1545	Communication Foundations	3
Upper-Level Chemistry Elective		3
Gen Ed Elective		3
Upper-Level Electives		5
<b>Semester Hours</b>		<b>15</b>

**Spring**

Upper-Level Chemistry Elective		3
Upper-Level Electives		5
Electives		7
<b>Semester Hours</b>		<b>15</b>
<b>Total Semester Hours</b>		<b>120-122</b>

Electives must include courses to fulfill the students chosen minor. Typically for Chemistry majors, the minor will be in Mathematics, Physics or Biology.

## Learning Outcomes

- Undergraduate students will demonstrate an understanding of the basic principles of the chemical disciplines included in their curriculum.
- Undergraduate students will demonstrate independent and critical thinking.
- Undergraduate students will demonstrate an understanding of the fundamentals of modern chemical instrumentation.
- Undergraduate students will effectively communicate their ideas both orally and in writing.