

# Chemistry and Biochemistry (CHBC)

Colin David Heyes  
Department Chair  
119 Chemistry Building  
479-575-5607  
Email: cheyes@uark.edu

Jingyi Chen  
Director of Graduate Studies  
119 Chemistry Building  
479-575-6203  
Email: chenj@uark.edu

cheminfo@uark.edu

Department of Chemistry and Biochemistry Website (<http://fulbright.uark.edu/departments/chemistry/>)

The Department of Chemistry and Biochemistry offers two degree programs leading to either Bachelor of Science degree or a Bachelor of Arts degree.

The Bachelor of Science degree offers students one of three concentrations: a chemistry concentration, a biophysical concentration and a biochemistry concentration.

The Bachelor of Arts degree offers students the choice of two concentrations: a chemistry concentration and a biochemistry concentration.

Students with satisfactory performance on the chemistry proficiency exam and who completed CHEM 14203 on the Fayetteville campus with grade of "C" or better can request credit for CHEM 14103.

## Requirements for a B.S. degree with a Major in Chemistry

In addition to the University Core requirements and the Fulbright College of Arts and Sciences Graduation Requirements, the following course requirements must be met. Bolded courses from the list below may be applied to portions of the University Core requirements.

A Minimum of 40 Semester Hours in Chemistry including:

8 hours of one of the two following sequences: 8

**CHEM 12073 Chemistry for Majors I**  
& **CHEM 12071and Chemistry for Majors I Laboratory**

**CHEM 12283 Chemistry for Majors II**  
& **CHEM 12281and Chemistry for Majors II Laboratory**

or

**CHEM 14103 University Chemistry I (ACTS Equivalency =**  
**& CHEM 14101CHEM 1414 Lecture)**  
and **University Chemistry I Laboratory (ACTS**  
**Equivalency = CHEM 1414 Lab)**

**CHEM 14203 University Chemistry II (ACTS Equivalency =**  
**& CHEM 14201CHEM 1424 Lecture)**  
and **University Chemistry II Laboratory (ACTS**  
**Equivalency = CHEM 1424 Lab)**

CHEM 22673 Analytical Chemistry Lecture 4  
& CHEM 22671 and Analytical Chemistry Laboratory

|                            |   |   |
|----------------------------|---|---|
| CHEM 35004                 | Physical Chemistry I  | 4 |
| CHEM 35102                 | Physical Chemistry Laboratory   | 2 |
| CHEM 35204                 | Physical Chemistry II   | 4 |
| CHEM 37073<br>& CHEM 37072 | Organic Chemistry I Lecture for Chemistry Majors<br>and Organic Chemistry I Lab for Chemistry Majors  | 5 |
| CHEM 37203<br>& CHEM 37072 | Organic Chemistry II Lecture for Chemistry Majors<br>and Organic Chemistry I Lab for Chemistry Majors | 5 |
| CHEM 41203                 | Advanced Inorganic Chemistry I  | 3 |
| CHEM 42203<br>& CHEM 42101 | Instrumental Analysis<br>and Instrumental Analysis Laboratory   | 4 |
| CHEM 47203                 | Experimental Methods in Organic Chemistry   | 3 |

And at least one additional Advanced Lecture course is required. 3

A minimum of 18 hours of science outside of chemistry are required, including math through:

|                   |  |          |
|-------------------|--|----------|
| <b>MATH 26004</b> | <b>Calculus III (Mathematics through MATH 26004)</b>   | <b>4</b> |
| <b>PHYS 20404</b> | <b>University Physics II (ACTS Equivalency =</b><br><b>PHYS 2044 Lecture) (Physics through PHYS</b><br><b>20404)</b> | <b>4</b> |

and physics through:

These mathematics and physics courses are prerequisites for some advanced courses and should be scheduled early in the student's program. Some work in the biological sciences is recommended.

This program meets the minimum requirements for certification by the American Chemical Society if CHEM 38103 (or CHEM 481H3/CHEM 484H3 or CHEM 58103/) is included. Sample schedules may be obtained from the department of chemistry and biochemistry. Prospective students should consult a departmental adviser.

**Writing Requirement:** Chemistry majors will satisfy the Fulbright College writing requirement by satisfactory completion of the formal research/analytical reports required in Physical Chemistry Laboratory, CHEM 34601 or CHEM 35102.

## Chemistry B.S. Eight-Semester Degree Program

Students wishing to follow the eight-semester degree plan should see the Eight-Semester Degree Policy (<http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy/>) in the Academic Regulations chapter for university requirements of the program. Core requirement hours may vary by individual, based on placement and previous credit granted. Once all core requirements are met, students may substitute a three-hour (or more) general elective in place of a core area. Students must complete at least 124 hours and this must be considered when scheduling upper-level hours in the senior year.

This program meets the minimum requirements for certification by the American Chemical Society if CHEM 38103 (or CHEM 481H3/CHEM 484H3 or CHEM 58103/CHEM 58403) is included.

| First Year  | Units |        |
|---|-------|--------|
|   | Fall  | Spring |
| ENGL 10103 Composition I (ACTS Equivalency = ENGL 1013)           | 3     |        |
| MATH 24004 Calculus I (ACTS Equivalency = MATH 2405) <sup>1</sup> | 4     |        |
| Select one of the following:                                      | 4     |        |

|  |    |    |
|--|----|----|
| CHEM 12073 Chemistry for Majors I<br>& CHEM 12071 Chemistry for Majors I<br>Laboratory   |    |    |
| CHEM 14103 University Chemistry I (ACTS<br>Equivalency = CHEM 1414 Lecture)<br>& CHEM 14101 University Chemistry I<br>Laboratory (ACTS Equivalency = CHEM 1414<br>Lab)   |    |    |
| University/State Core U.S. History requirement   | 3  |    |
| General Elective   | 3  |    |
| ENGL 10203 Composition II (ACTS Equivalency =<br>ENGL 1023)  |    | 3  |
| MATH 25004 Calculus II <sup>1</sup>  | 4  |    |
| Select one of the following:   | 4  |    |
| CHEM 12283 Chemistry for Majors II<br>& CHEM 12281 Chemistry for Majors II<br>Laboratory   |    |    |
| CHEM 14203 University Chemistry II (ACTS<br>Equivalency = CHEM 1424 Lecture)<br>& CHEM 14201 University Chemistry II<br>Laboratory (ACTS Equivalency = CHEM 1424<br>Lab) |    |    |
| University/State Core Social Science requirement   |    | 3  |
| Year Total:  | 17 | 14 |

| Second Year  | Units |        |
|--|-------|--------|
|  | Fall  | Spring |
| MATH 26004 Calculus III <sup>1</sup>   | 4     |        |
| PHYS 20304 University Physics I (ACTS<br>Equivalency = PHYS 2034) <sup>1</sup>   | 4     |        |
| CHEM 37073 Organic Chemistry I Lecture for<br>Chemistry Majors<br>& CHEM 37072 Organic Chemistry I Lab for<br>Chemistry Majors <sup>1,2</sup>  | 5     |        |
| University/State Core Fine Arts or Humanities<br>requirement   |       | 3      |
| PHYS 20404 University Physics II (ACTS<br>Equivalency = PHYS 2044 Lecture) <sup>1</sup>  |       | 4      |
| CHEM 37203 Organic Chemistry II Lecture for<br>Chemistry Majors<br>& CHEM 37072 Organic Chemistry I Lab for<br>Chemistry Majors <sup>1,2</sup> |       | 5      |
| University/State Core Humanities or Fine Arts<br>requirement (as needed)   |       | 3      |
| University/State Core Social Science requirement   |       | 3      |
| Year Total:  | 16    | 15     |

| Third Year   | Units |        |
|--|-------|--------|
|  | Fall  | Spring |
| CHEM 35004 Physical Chemistry I <sup>1,2</sup>   | 4     |        |
| CHEM 22673 Analytical Chemistry Lecture<br>& CHEM 22671 Analytical Chemistry Laboratory <sup>1</sup> | 4     |        |
| Select one of the following:   | 3-4   |        |

|  |    |     |
|--|----|-----|
| BIOL 10103 Principles of Biology (ACTS<br>Equivalency = BIOL 1014 Lecture)<br>& BIOL 10101 Principles of Biology Laboratory<br>(ACTS Equivalency = BIOL 1014 Lab) <sup>1</sup> |    |     |
| General Elective   |    |     |
| University/State Core Social Science requirement   | 3  |     |
| CHEM 35204 Physical Chemistry II<br>& CHEM 35102 Physical Chemistry Laboratory <sup>1,2</sup>  |    | 6   |
| Advanced Level Elective Course <sup>1</sup>  |    | 4   |
| Select one of the following:   |    | 3-4 |
| BIOL 10103 Principles of Biology (ACTS<br>Equivalency = BIOL 1014 Lecture)<br>& BIOL 10101 Principles of Biology Laboratory<br>(ACTS Equivalency = BIOL 1014 Lab)              |    |     |
| General Elective   |    |     |
| General Elective   |    | 3   |
| Year Total:  | 14 | 16  |

| Fourth Year   | Units |        |
|---|-------|--------|
|   | Fall  | Spring |
| CHEM 41203 Advanced Inorganic Chemistry I <sup>1,2</sup>  | 3     |        |
| CHEM 47203 Experimental Methods in Organic<br>Chemistry <sup>1,2</sup>                              | 3     |        |
| CHEM 38103 Elements of Biochemistry <sup>1,2</sup>  | 3     |        |
| CHEM Elective   | 3     |        |
| General Elective  | 3     |        |
| CHEM 42203 Instrumental Analysis<br>& CHEM 42101 Instrumental Analysis<br>Laboratory <sup>1,2</sup> |       | 4      |
| CHEM 48503 Biochemical Techniques <sup>1,2</sup>  |       | 3      |
| General Electives (as needed to total 120)  |       | 6      |
| Year Total:   | 15    | 13     |

**Total Units in Sequence: 120**

<sup>1</sup> Meets 40-hour advanced credit hour requirement. See College Academic Regulations on page 131 of this chapter

<sup>2</sup> Meets 24-hour rule (24 hours of 3000-4000 level courses in Fulbright College), in addition to meeting the 40-hour rule. See College Academic Regulations on page 131 of this chapter.

## Requirements for a B.S. degree with a Major in Chemistry, Biophysical Concentration

In addition to the University Core requirements and the Fulbright College of Arts and Sciences Graduation Requirements (see College Academic Regulations and Degree Completion Policy), the following course requirements must be met. Bolded courses from the list below may be applied to portions of the University Core requirements.

A Minimum of 43 Semester Hours in Chemistry including:

One of the following sequences: 8

**CHEM 12073 Chemistry for Majors I  
& CHEM 12071and Chemistry for Majors I Laboratory**  
and

**CHEM 12283 Chemistry for Majors II  
& CHEM 12281and Chemistry for Majors II Laboratory**

|     |   |   |          |
|-----|---|---|----------|
| or  |   |   |          |
|     | <b>CHEM 14103</b>   | <b>University Chemistry I (ACTS Equivalency = &amp; CHEM 14101CHEM 1414 Lecture) and University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)</b>   |          |
| and |   |   |          |
|     | <b>CHEM 14203</b>   | <b>University Chemistry II (ACTS Equivalency = &amp; CHEM 14201CHEM 1424 Lecture) and University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)</b> |          |
|     | CHEM 22673 & CHEM 22671   | Analytical Chemistry Lecture and Analytical Chemistry Laboratory  | 4        |
|     | CHEM 35004  | Physical Chemistry I  | 4        |
|     | Select one of the following sequences:  |   | 8 - 10   |
|     | CHEM 36053 & CHEM 36051   | Organic Chemistry I and Organic Chemistry I Laboratory  |          |
| and |   |   |          |
|     | CHEM 36203 & CHEM 36201   | Organic Chemistry II and Organic Chemistry II Laboratory  |          |
| or  |   |   |          |
|     | CHEM 37073 & CHEM 37072   | Organic Chemistry I Lecture for Chemistry Majors and Organic Chemistry I Lab for Chemistry Majors   |          |
| and |   |   |          |
|     | CHEM 37203 & CHEM 37202   | Organic Chemistry II Lecture for Chemistry Majors and Organic Chemistry II Lab for Chemistry Majors   |          |
|     | CHEM 35204 & CHEM 35102   | Physical Chemistry II and Physical Chemistry Laboratory   | 6        |
|     | CHEM 42203 & CHEM 42101   | Instrumental Analysis and Instrumental Analysis Laboratory  | 4        |
|     | and either:   |   | 3        |
|     | CHEM 48503  | Biochemical Techniques  |          |
|     | Or completion of a senior thesis based on independent research wherein at least one credit hour is earned in: |   |          |
|     | CHEM 4000V  | Chemistry Research  |          |
|     | during each of 3 different semesters.   |   |          |
|     | Select six hours from one of the following sequences:   |   | 6        |
|     | CHEM 58103 and CHEM 58403   |   |          |
|     | CHEM 481H3 and CHEM 484H3   |   |          |
|     | CHEM 38103 and CHEM 47203   |   |          |
|     | <b>MATH 24004</b>   | <b>Calculus I (ACTS Equivalency = MATH 2405)</b>  | <b>4</b> |
|     | <b>MATH 25004</b>   | <b>Calculus II</b>  | <b>4</b> |
|     | <b>PHYS 20304</b>   | <b>University Physics I (ACTS Equivalency = PHYS 2034) (With Lab Component)</b>   | <b>4</b> |
|     | <b>PHYS 20404</b>   | <b>University Physics II (ACTS Equivalency = PHYS 2044 Lecture) (With Lab Component)</b>  | <b>4</b> |
|     | 11 Hours from the Biological Sciences to include:   |   | 11       |
|     | <b>BIOL 10103</b> & <b>BIOL 10101</b>   | <b>Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture) and Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)</b>                     |          |
|     | BIOL 25473 & BIOL 25471   | Cell Biology and Cell Biology Laboratory  |          |
|     | And one additional lecture course numbered above 3000.  |   |          |

The mathematics and physics courses are prerequisites for some advanced courses and should be scheduled early in the student's program.

**Total Hours** **70-72**

The mathematics and physics courses are prerequisites for some advanced courses and should be scheduled early in the student's program.

**Writing Requirement:** Chemistry majors will satisfy the Fulbright College writing requirement by satisfactory completion of the formal research/analytical reports required in Physical Chemistry Laboratory, CHEM 34601 or CHEM 35102.

## Chemistry B.S. with Biophysical Option Eight-Semester Degree Program

Students wishing to follow the eight-semester degree plan should see the Eight-Semester Degree Policy (<http://catalog.uark.edu/undergraduatelcatalog/academicregulations/eightssemesterdegreecompletionpolicy/>) in the Academic Regulations chapter for university requirements of the program. Core requirement hours may vary by individual, based on placement and previous credit granted. Once all core requirements are met, students may substitute a three-hour (or more) general elective in place of a core area.

| First Year   | Units       |               |
|--|-------------|---------------|
|  | Fall        | Spring        |
| ENGL 10103 Composition I (ACTS Equivalency = ENGL 1013)  | 3           |               |
| CHEM 14103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) & CHEM 14101 University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)   | 4           |               |
| MATH 24004 Calculus I (ACTS Equivalency = MATH 2405) <sup>1</sup>  | 4           |               |
| University/State Core Fine Arts or Humanities Course   | 3           |               |
| ENGL 10203 Composition II (ACTS Equivalency = ENGL 1023)   |             | 3             |
| MATH 25004 Calculus II <sup>1</sup>  |             | 4             |
| CHEM 14203 University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) & CHEM 14201 University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab) |             | 4             |
| University/State Core Humanities or Fine Arts course (as needed)   |             | 3             |
| University/State Core U.S. History Course  |             | 3             |
| Year Total:  | 14          | 17            |
| <b>Second Year</b>   |             | <b>Units</b>  |
|  | <b>Fall</b> | <b>Spring</b> |
| CHEM 36053 Organic Chemistry I & CHEM 36051 Organic Chemistry I Laboratory <sup>1,2</sup>  | 4           |               |
| PHYS 20304 University Physics I (ACTS Equivalency = PHYS 2034) <sup>1</sup>  | 4           |               |

|   |    |    |
|---|----|----|
| BIOL 10103 Principles of Biology (ACTS<br>Equivalency = BIOL 1014 Lecture)<br>& BIOL 10101 Principles of Biology Laboratory<br>(ACTS Equivalency = BIOL 1014 Lab) | 4  |    |
| University/State Core Social Science Course   | 3  |    |
| CHEM 36203 Organic Chemistry II<br>& CHEM 36201 Organic Chemistry II<br>Laboratory <sup>1,2</sup>   | 4  |    |
| PHYS 20404 University Physics II (ACTS<br>Equivalency = PHYS 2044 Lecture) <sup>1</sup>   | 4  |    |
| BIOL 25473 Cell Biology<br>& BIOL 25471 Cell Biology Laboratory   | 4  |    |
| CHEM 22673 Analytical Chemistry Lecture <sup>1</sup>  | 3  |    |
| Year Total:   | 15 | 15 |

| Third Year  | Units |        |
|---|-------|--------|
|   | Fall  | Spring |
| CHEM 22671 Analytical Chemistry Laboratory <sup>1</sup>   | 1     |        |
| CHEM 35004 Physical Chemistry I <sup>1,2</sup>  | 4     |        |
| Advanced Level Elective <sup>1</sup>  | 6     |        |
| University/State Core Social Science Course   | 3     |        |
| CHEM 35204 Physical Chemistry II<br>& CHEM 35102 Physical Chemistry Laboratory <sup>1,2</sup>       |       | 6      |
| CHEM 42203 Instrumental Analysis<br>& CHEM 42101 Instrumental Analysis<br>Laboratory <sup>1,2</sup> |       | 4      |
| University/State Core Social Science Course   |       | 3      |
| General Elective  |       | 3      |
| Year Total:   | 14    | 16     |

| Fourth Year   | Units |        |
|---|-------|--------|
|   | Fall  | Spring |
| CHEM 58103 Biochemistry I <sup>1,2</sup><br>or CHEM 481H3 Honors Biochemistry I   | 3     |        |
| BIOL 3000/4000 Level Elective <sup>1,2</sup>                                      | 3     |        |
| General Electives   | 9     |        |
| CHEM 58403 Biochemistry II <sup>1,2</sup><br>or CHEM 484H3 Honors Biochemistry II |       | 3      |
| CHEM 48503 Biochemical Techniques <sup>1,2</sup>                                  |       | 3      |
| General Electives   |       | 8      |
| Year Total:   | 15    | 14     |

**Total Units in Sequence: 120**

<sup>1</sup> Meets 40-hour advanced credit hour requirement. See College Academic Regulations.

<sup>2</sup> Meets 24-hour rule (24 hours of 3000-4000 level courses in Fulbright College), in addition to meeting the 40-hour rule. See College Academic Regulations.

#### Requirements for a B.S. degree with a Major in Chemistry,

**Biochemistry Concentration:** In addition to the University Core (<http://catalog.uark.edu/undergraduatecatalog/academicregulations/universitycore/>) requirements and the Fulbright College of Arts and Sciences Graduation Requirements (<http://catalog.uark.edu/undergraduatecatalog/collegesandschools/>)

([www.williamfulbrightcollegeofartsandsciences.edu/](http://www.williamfulbrightcollegeofartsandsciences.edu/)) (see College Academic Regulations and Degree Completion Policy (<http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy/>)), the following course requirements must be met. Bolded courses from the list below may be applied to portions of the University Core requirements.

A Minimum of 38 Semester Hours in Chemistry including:

One of the following sequences of courses: 8

**CHEM 12073 Chemistry for Majors I  
& CHEM 12071and Chemistry for Majors I Laboratory**

and

**CHEM 12283 Chemistry for Majors II  
& CHEM 12281and Chemistry for Majors II Laboratory**

or

**CHEM 14103 University Chemistry I (ACTS Equivalency =  
& CHEM 14101CHEM 1414 Lecture)  
and University Chemistry I Laboratory (ACTS  
Equivalency = CHEM 1414 Lab)**

and

**CHEM 14203 University Chemistry II (ACTS Equivalency =  
& CHEM 14201CHEM 1424 Lecture)  
and University Chemistry II Laboratory (ACTS  
Equivalency = CHEM 1424 Lab)**

CHEM 22673 Analytical Chemistry Lecture 4  
& CHEM 22671 and Analytical Chemistry Laboratory

Select from the following: 4 -  
10

CHEM 35004 Physical Chemistry I

and

CHEM 35204 Physical Chemistry II  
& CHEM 35102and Physical Chemistry Laboratory

or

CHEM 34603 Elements of Physical Chemistry  
& CHEM 34601and Elements of Physical Chemistry Laboratory

CHEM 37073 Organic Chemistry I Lecture for Chemistry Majors 5  
& CHEM 37072 and Organic Chemistry I Lab for Chemistry Majors

CHEM 37203 Organic Chemistry II Lecture for Chemistry Majors 5  
& CHEM 37202 and Organic Chemistry II Lab for Chemistry  
Majors

Either 3

CHEM 48503 Biochemical Techniques

Or completion of a senior thesis based on independent research wherein at least 1 credit hour is earned in CHEM 4000V (chemistry research) and/or CHEM 400HV (honors chemistry research) during each of 3 different semesters.

One of the following sequences: 6

CHEM 481H3 and CHEM 484H3

CHEM 38103 and CHEM 47203

CHEM 42203 Instrumental Analysis 3-4  
& CHEM 42101 and Instrumental Analysis Laboratory

or CHEM 41203Advanced Inorganic Chemistry I

Additional Required Courses to Include:

**MATH 24004 Calculus I (ACTS Equivalency = MATH 2405) 4**

**MATH 25004 Calculus II 4**

Select one of the following physics sequences: 8

**PHYS 20103 College Physics I (ACTS Equivalency = PHYS & PHYS 20101 2014 Lecture) and College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab)**

and

**PHYS 20203 College Physics II (ACTS Equivalency = PHYS & PHYS 20201 2024 Lecture) and College Physics II Laboratory (ACTS Equivalency = PHYS 2024 Lab)**

or

**PHYS 20304 University Physics I (ACTS Equivalency = PHYS 2034) (With Lab Component)**

and

**PHYS 20404 University Physics II (ACTS Equivalency = PHYS 2044 Lecture) (With Lab Component)**

15 Hours of Biological Sciences to include:

**BIOL 10103 Principles of Biology (ACTS Equivalency = & BIOL 10101 BIOL 1014 Lecture) and Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)** 4

BIOL 25473 Cell Biology 4  
& BIOL 25471 and Cell Biology Laboratory

BIOL 20003 General Microbiology (ACTS Equivalency = BIOL & BIOL 20001 2004 Lecture) 4  
and General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab)

BIOL 42373 Genomics and Bioinformatics 3  
or BIOL 23373 General Genetics

The mathematics and physics courses are prerequisites for some advanced courses and should be scheduled early in the student's program.

**Total Hours 69-76**

**Writing Requirement:** Chemistry majors will satisfy the Fulbright College writing requirement by satisfactory completion of the formal research/analytical reports required in Physical Chemistry Laboratory, CHEM 34601 or CHEM 35102.

## Chemistry B.S. with Biochemistry Option Eight-Semester Degree Program

Students wishing to follow the eight-semester degree plan should see the Eight-Semester Degree Policy (<http://catalog.uark.edu/undergradcatalog/academicregulations/eightsemesterdegreecompletionpolicy/>) in the Academic Regulations chapter for university requirements of the program. Core requirement hours may vary by individual, based on placement and previous credit granted. Once all core requirements are met, students may substitute a three-hour (or more) general elective in place of a core area.

This program meets the minimum requirements for certification by the American Chemical Society if CHEM 38103 (or CHEM 481H3/CHEM 484H3) is included.

|   | Units |        |
|---|-------|--------|
|   | Fall  | Spring |
| ENGL 10103 Composition I (ACTS Equivalency = ENGL 1013) | 3     |        |
| Select one of the following:                            | 4     |        |

MATH 12003 Plane Trigonometry (ACTS Equivalency = MATH 1203)

MATH 13004 Precalculus Mathematics (ACTS Equivalency = MATH 1305)

MATH 24004 Calculus I (ACTS Equivalency = MATH 2405)<sup>1</sup>

Select one of the following: 4

CHEM 12073 Chemistry for Majors I & CHEM 12071 Chemistry for Majors I Laboratory

CHEM 14103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) & CHEM 14101 University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)

University/State Core Fine Arts or Humanities requirement 3

University/State Core U.S. History requirement if taking MATH 12003 0-3

ENGL 10203 Composition II (ACTS Equivalency = ENGL 1023) 3

MATH 24004 Calculus I (ACTS Equivalency = MATH 2405)<sup>1</sup> 4

or MATH 25004 Calculus II 4

Select one of the following: 4

CHEM 12283 Chemistry for Majors II & CHEM 12281 Chemistry for Majors II Laboratory

CHEM 14203 University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) & CHEM 14201 University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)

University/State Core Humanities or Fine Arts requirement (as needed) 3

University/State Core Social Science requirement 3

Year Total: 14 17

| Second Year | Units |        |
|-------------|-------|--------|
|             | Fall  | Spring |

Select one of the following as needed: 3-4

MATH 25004 Calculus II (if not already taken)<sup>1</sup>  
University/state core U.S. history requirement (as needed)

Select one of the following: 4

PHYS 20103 College Physics I (ACTS Equivalency = PHYS 2014 Lecture) & PHYS 20101 College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab)<sup>1</sup>

PHYS 20304 University Physics I (ACTS Equivalency = PHYS 2034)<sup>1,3</sup>

CHEM 37073 Organic Chemistry I Lecture for Chemistry Majors 5

& CHEM 37072 Organic Chemistry I Lab for Chemistry Majors<sup>1,2</sup>

University/State Core Social Science requirement 3

Select one of the following: 4

|   |    |    |
|---|----|----|
| PHYS 20203 College Physics II (ACTS<br>Equivalency = PHYS 2024 Lecture)<br>& PHYS 20201 College Physics II Laboratory<br>(ACTS Equivalency = PHYS 2024 Lab) <sup>1</sup><br>PHYS 20404 University Physics II (ACTS<br>Equivalency = PHYS 2044 Lecture) <sup>1</sup> |    |    |
| CHEM 37203 Organic Chemistry II Lecture for<br>Chemistry Majors<br>& CHEM 37202 Organic Chemistry II Lab for<br>Chemistry Majors <sup>1,2</sup>   | 5  |    |
| BIOL 10103 Principles of Biology (ACTS<br>Equivalency = BIOL 1014 Lecture)<br>& BIOL 10101 Principles of Biology Laboratory<br>(ACTS Equivalency = BIOL 1014 Lab)<br>CHEM 22673 Analytical Chemistry Lecture <sup>1,2</sup>   | 4  | 3  |
| Year Total:   | 15 | 16 |

| Third Year  | Units |        |
|---|-------|--------|
|   | Fall  | Spring |
| CHEM 34603 Elements of Physical Chemistry<br>& CHEM 34601 Elements of Physical Chemistry<br>Laboratory <sup>1,2</sup>   | 4     |        |
| CHEM 22671 Analytical Chemistry Laboratory <sup>1</sup>   | 1     |        |
| BIOL 25473 Cell Biology<br>& BIOL 25471 Cell Biology Laboratory   | 4     |        |
| University/State Core Social Science requirements   | 3     |        |
| General Elective  | 3     |        |
| Select one of the following:  |       | 3-4    |
| CHEM 42203 Instrumental Analysis<br>& CHEM 42101 Instrumental Analysis<br>Laboratory <sup>1,2</sup>   |       |        |
| CHEM 41203 Advanced Inorganic Chemistry <sup>1,2</sup>  |       |        |
| BIOL 20003 General Microbiology (ACTS<br>Equivalency = BIOL 2004 Lecture)<br>& BIOL 20001 General Microbiology Laboratory<br>(ACTS Equivalency = BIOL 2004 Lab) |       | 4      |
| 3000+ General Elective (if CHEM 41203 is taken),<br>else General Elective   |       | 3      |
| General Electives   |       | 6      |
| Year Total:   | 15    | 16     |

| Fourth Year   | Units |        |
|---|-------|--------|
|   | Fall  | Spring |
| CHEM 481H3 Honors Biochemistry I <sup>1,2</sup>   | 3     |        |
| BIOL 23373 General Genetics<br>& BIOL 23371 General Genetics Laboratory <sup>1,2</sup><br>or BIOL 42373 Genomics and Bioinformatics | 3     |        |
| 3000+ General Elective (if BIOL 2323 is taken),<br>else General Elective  | 3     |        |
| General Electives   | 6     |        |
| CHEM 484H3 Honors Biochemistry II <sup>1,2</sup>  | 3     |        |
| CHEM 48503 Biochemical Techniques <sup>1,2</sup>  | 3     |        |
| General Electives as needed to complete 120-hour<br>requirement   | 6     |        |
| Year Total:   | 15    | 12     |

**Total Units in Sequence:** **120**

- <sup>1</sup> Meets 40-hour advanced credit hour requirement. See College Academic Regulations on page 131 of this chapter.
- <sup>2</sup> Meets 24-hour rule (24 hours of 3000-4000 level courses in Fulbright College), in addition to meeting the 40-hour rule. See College Academic Regulations on page 131 of this chapter.
- <sup>3</sup> PHYS 20304 Calculus Based University Physics (pre- or co-requisite MATH 24004) and PHYS 20404 (pre- or co-requisite MATH 25004), is a better choice for students interested in graduate school.

## Requirements for a B.A. degree with a Major in Chemistry with Chemistry Concentration

In addition to the University Core requirements and the Fulbright College of Arts and Sciences Graduation Requirements, the following course requirements must be met. Bolded courses from the list below may be applied to portions of the university/state minimum core requirements.

Completion of a World Language Course at the 2003 Intermediate I level.

Select one of the following: **8**

**CHEM 12073 Chemistry for Majors I & CHEM 12071and Chemistry for Majors I Laboratory and Chemistry for Majors II & CHEM 12283and Chemistry for Majors II Laboratory & CHEM 12281**

**CHEM 14103 University Chemistry I (ACTS Equivalency = & CHEM 14101CHEM 1414 Lecture) and University Chemistry I Laboratory (ACTS & CHEM 14203Equivalency = CHEM 1414 Lab) and University Chemistry II (ACTS Equivalency & CHEM 14201= CHEM 1424 Lecture) and University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)**

CHEM 22673 Analytical Chemistry Lecture **4**  
& CHEM 22671 and Analytical Chemistry Laboratory

Select one of the following: **8**

**CHEM 37073 Organic Chemistry I Lecture for Chemistry Majors & CHEM 37072and Organic Chemistry I Lab for Chemistry Majors & CHEM 37203and Organic Chemistry II Lecture for Chemistry Majors & CHEM 37202and Organic Chemistry II Lab for Chemistry Majors**

CHEM 36053 Organic Chemistry I  
& CHEM 36051and Organic Chemistry I Laboratory  
and Organic Chemistry II  
& CHEM 36203and Organic Chemistry II Laboratory  
& CHEM 36201

Select one of the following: **4-10**

CHEM 34603 Elements of Physical Chemistry  
& CHEM 34601and Elements of Physical Chemistry Laboratory <sup>1</sup>

CHEM 35004 Physical Chemistry I  
& CHEM 35204and Physical Chemistry II  
and Physical Chemistry Laboratory <sup>2</sup>  
& CHEM 35102

Two Additional Lecture Courses Numbered Above 3000. 6

**Total Hours** 30-36<sup>1</sup> PHYS 20203/PHYS 20101 and MATH 24004 or MATH 22003 are prerequisites for CHEM 34603<sup>2</sup> PHYS 20404 and MATH 26004 are prerequisites for the alternate physical chemistry course sequence CHEM 35004 and CHEM 35204/CHEM 35102.

These physics and mathematics prerequisite requirements are substantial, and these courses and their prerequisites should be scheduled early in the student's program. Sample schedules may be obtained from the department of chemistry and biochemistry. Prospective students should consult a departmental adviser.

**Writing Requirement:** Chemistry majors will satisfy the Fulbright College writing requirement by satisfactory completion of the formal research/analytical reports required in Physical Chemistry Laboratory, CHEM 34601 or CHEM 35102.

## Chemistry B.A. Eight-Semester Degree Program

Students wishing to follow the eight-semester degree plan should see the Eight-Semester Degree Policy (<http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy/>) in the Academic Regulations chapter for university requirements of the program. Core requirement hours may vary by individual, based on placement and previous credit granted. Once all core requirements are met, students may substitute a three-hour (or more) general elective in place of a core area.

| First Year   | Units |        |
|--|-------|--------|
|  | Fall  | Spring |
| ENGL 10103 Composition I (ACTS Equivalency = ENGL 1013)  | 3     |        |
| Select one of the following:   | 3-4   |        |
| MATH 11003 College Algebra (ACTS Equivalency = MATH 1103) (if required)  |       |        |
| MATH 22003 Survey of Calculus (ACTS Equivalency = MATH 2203) <sup>1</sup>  |       |        |
| MATH 24004 Calculus I (ACTS Equivalency = MATH 2405) (as advised) <sup>1,3</sup>   |       |        |
| Select one of the following:   | 4     |        |
| CHEM 12073 Chemistry for Majors I & CHEM 12071 Chemistry for Majors I Laboratory   |       |        |
| CHEM 14103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) & CHEM 14101 University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab) |       |        |
| Elementary II World Language Course Numbered 1013  | 3     |        |
| University/State Core US History requirement   | 3     |        |
| ENGL 10203 Composition II (ACTS Equivalency = ENGL 1023)   |       | 3      |
| Select one of the following as needed:   | 3-4   |        |

MATH 22003 Survey of Calculus (ACTS Equivalency = MATH 2203)<sup>1</sup>MATH 24004 Calculus I (ACTS Equivalency = MATH 2405)<sup>3</sup>

Elective

Select one of the following:

CHEM 12283 Chemistry for Majors II &amp; CHEM 12281 Chemistry for Majors II Laboratory

CHEM 14203 University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) &amp; CHEM 14201 University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)

Intermediate I World Language Course Numbered 2003 3

University/State Core Social Science requirement 3

Year Total: 16 15

| Second Year   | Units |        |
|---|-------|--------|
|   | Fall  | Spring |
| Select one of the following:  | 4-5   |        |
| CHEM 37073 Organic Chemistry I Lecture for Chemistry Majors & CHEM 37072 Organic Chemistry I Lab for Chemistry Majors <sup>1,2</sup>                          |       |        |
| CHEM 36053 Organic Chemistry I & CHEM 36051 Organic Chemistry I Laboratory <sup>1,2</sup>   |       |        |
| PHYS 20103 College Physics I (ACTS Equivalency = PHYS 2014 Lecture) & PHYS 20101 College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab) <sup>1</sup> | 4     |        |
| University/State Core Fine Arts or Humanities requirement   |       | 3      |
| University/State Core Social Science requirement  |       | 3      |
| General Elective  |       | 3      |
| Select one of the following:  |       | 4-5    |
| CHEM 37203 Organic Chemistry II Lecture for Chemistry Majors & CHEM 37202 Organic Chemistry II Lab for Chemistry Majors <sup>1,2</sup>                        |       |        |
| CHEM 36203 Organic Chemistry II & CHEM 36201 Organic Chemistry II Laboratory <sup>1,2</sup>   |       |        |
| University/State Core Humanities or Fine Arts requirement (as needed)   |       | 3      |
| PHYS 20203 College Physics II (ACTS Equivalency = PHYS 2024 Lecture) & PHYS 20201 College Physics II Laboratory (ACTS Equivalency = PHYS 2024 Lab)            |       | 4      |
| University/State Core Social Science requirement (as needed)  |       | 3      |
| Year Total:   | 17    | 14     |

| Third Year  | Units |        |
|---|-------|--------|
|   | Fall  | Spring |
| CHEM 22673 Analytical Chemistry Lecture <sup>1</sup>  | 3     |        |
| CHEM 34603 Elements of Physical Chemistry & CHEM 34601 Elements of Physical Chemistry Laboratory <sup>1,2</sup> | 4     |        |
| General Electives   | 9     |        |
| General Electives   |       | 16     |
| Year Total:   | 16    | 16     |

| Fourth Year  | Units |        |
|--|-------|--------|
|  | Fall  | Spring |
| CHEM 38103 Elements of Biochemistry <sup>1,2</sup> or CHEM 481H3 Honors Biochemistry I | 3     |        |
| CHEM 22671 Analytical Chemistry Laboratory <sup>1</sup>                                | 1     |        |
| Upper Level Fulbright College Elective <sup>1,2</sup>                                  | 3     |        |
| General Elective   | 7     |        |
| CHEM 48503 Biochemical Techniques <sup>1,2</sup>                                       |       | 3      |
| Select one of the following:   |       | 3      |
| CHEM 484H3 Honors Biochemistry II <sup>1,2</sup>                                       |       |        |
| 3000+ CHEM Elective <sup>1,2</sup>   |       |        |
| General Electives  |       | 6      |
| Year Total:  | 14    | 12     |

**Total Units in Sequence: 120**

<sup>1</sup> Meets 40-hour advanced credit hour requirement. See College Academic Regulations.

<sup>2</sup> Meets 24-hour rule (24 hours of 3000-4000 level courses in Fulbright College), in addition to meeting the 40-hour rule. See College Academic Regulations.

<sup>3</sup> Depends on placement; MATH 22003 Survey of Calculus is another option for this degree. Student may also choose to take MATH 13004 Precalculus in Fall Semester 1 and MATH 24004 Calculus in Spring Semester 1. Another option is to complete MATH 11003 in Fall Semester 1 and MATH 22003 Survey of Calculus in Spring Semester 1.

## Requirements for a B.A. degree with a Major in Chemistry with Biochemistry Concentration

In addition to the University Core requirements and the Fulbright College of Arts and Sciences Graduation Requirements (see College Academic Regulations and Degree Completion Policy), the following course requirements must be met. Bolded courses from the list below may be applied to portions of the University Core requirements.

A minimum of 32 semester hours in chemistry including:

|  |   |
|--|---|
| Select one of the following:   | 8 |
| <b>CHEM 12073 Chemistry for Majors I &amp; CHEM 12071and Chemistry for Majors I Laboratory and Chemistry for Majors II &amp; CHEM 12283and Chemistry for Majors II Laboratory &amp; CHEM 12281</b> |   |

|  |      |
|--|------|
| CHEM 14103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) (CHEM 14101, CHEM 14203, CHEM 14201)  |      |
| CHEM 22673 Analytical Chemistry Lecture & CHEM 22671 and Analytical Chemistry Laboratory   | 4    |
| Select one of the following:   | 4-10 |
| CHEM 34603 Elements of Physical Chemistry & CHEM 34601and Elements of Physical Chemistry Laboratory  |      |
| CHEM 35004 Physical Chemistry I & CHEM 35204and Physical Chemistry II and Physical Chemistry Laboratory & CHEM 35102   |      |
| Select one of the following:   | 8    |
| CHEM 36053 Organic Chemistry I & CHEM 36051and Organic Chemistry I Laboratory and Organic Chemistry II & CHEM 36203and Organic Chemistry II Laboratory & CHEM 36201  |      |
| CHEM 37073 Organic Chemistry I Lecture for Chemistry Majors & CHEM 37072and Organic Chemistry I Lab for Chemistry Majors & CHEM 37203and Organic Chemistry II Lecture for Chemistry Majors & CHEM 37202and Organic Chemistry II Lab for Chemistry Majors   |      |
| Select one of the following:   | 3    |
| CHEM 48503 Biochemical Techniques  |      |
| Or completion of a senior thesis based on independent research wherein at least 1 credit hour is earned in CHEM 4000V (chemistry research) and/or CHEM 400HV (honors chemistry research) during each of 3 different semesters.   |      |
| Select one of the following:   | 6-7  |
| CHEM 58103-CHEM 58403 (same as CHEM 481H3-CHEM 484H3)  |      |
| CHEM 38103 Elements of Biochemistry & CHEM 42203and Instrumental Analysis and Instrumental Analysis Laboratory & CHEM 42101  |      |
| CHEM 38103 Elements of Biochemistry & CHEM 41203and Advanced Inorganic Chemistry I   |      |
| CHEM 38103 Elements of Biochemistry & CHEM 47203and Experimental Methods in Organic Chemistry  |      |
| <b>MATH 24004 Calculus I (ACTS Equivalency = MATH 2405) or MATH 22003Survey of Calculus (ACTS Equivalency = MATH 2203)</b>   | 4    |
| Select one of the following:   | 8    |
| <b>PHYS 20103 College Physics I (ACTS Equivalency = PHYS &amp; PHYS 20101 2014 Lecture) and College Physics I Laboratory (ACTS &amp; PHYS 20203 Equivalency = PHYS 2014 Lab) and College Physics II (ACTS Equivalency = &amp; PHYS 20201 PHYS 2024 Lecture) and College Physics II Laboratory (ACTS Equivalency = PHYS 2024 Lab)</b> |      |
| <b>PHYS 20304 / PHYS 20404</b>   |      |
| Four courses from the Biological Sciences (at least 3 hours of which must be upper-level courses)  | 11   |



Completion of a World Language Course at the 2003 Intermediate I Level.

**Total Hours** **56-63**

The mathematics and physics courses are prerequisites for some advanced courses and should be scheduled early in the student's program.

**Writing Requirement:** Chemistry majors will satisfy the Fulbright College writing requirement by satisfactory completion of the formal research/analytical reports required in Physical Chemistry Laboratory, CHEM 34601 or CHEM 35102.

## Chemistry B.A. with Biochemistry Option Eight-Semester Degree Program

Students wishing to follow the eight-semester degree plan should see the Eight-Semester Degree Policy (<http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy/>) in the Academic Regulations chapter for university requirements of the program. The following eight-semester plan refers to additional B.A. Core requirement hours may vary by individual, based on placement and previous credit granted. Once all core requirements are met, students may substitute a three-hour (or more) general elective in place of a core area.

| First Year   | Units |        |
|--|-------|--------|
|  | Fall  | Spring |
| ENGL 10103 Composition I (ACTS Equivalency = ENGL 1013)  | 3     |        |
| MATH 24004 Calculus I (ACTS Equivalency = MATH 2405) (or other mathematics course as advised for major) <sup>1,3</sup>                                       | 3-4   |        |
| Select one of the following:   | 4     |        |
| CHEM 12073 Chemistry for Majors I & CHEM 12071 Chemistry for Majors I Laboratory   |       |        |
| CHEM 14103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) & CHEM 14101 University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)   |       |        |
| Elementary II World Language Course  | 3     |        |
| University/State Core US History requirement   | 3     |        |
| ENGL 10203 Composition II (ACTS Equivalency = ENGL 1023)   |       | 3      |
| MATH 25004 Calculus II <sup>1,3</sup>  |       | 4      |
| Select one of the following:   |       | 4      |
| CHEM 12283 Chemistry for Majors II & CHEM 12281 Chemistry for Majors II Laboratory   |       |        |
| CHEM 14203 University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) & CHEM 14201 University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab) |       |        |
| Intermediate I World Language Course   |       | 3      |
| University/State Core Social Science requirement   |       | 3      |
| Year Total:  | 17    | 17     |

| Second Year   | Units |        |
|---|-------|--------|
|   | Fall  | Spring |
| BIOL 10103 Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture) & BIOL 10101 Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)        | 4     |        |
| Select one of the following:  | 4     |        |
| PHYS 20304 University Physics I (ACTS Equivalency = PHYS 2034) <sup>1</sup>   |       |        |
| PHYS 20103 College Physics I (ACTS Equivalency = PHYS 2014 Lecture) & PHYS 20101 College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab) <sup>1</sup>   |       |        |
| Advanced Elective <sup>1</sup>  |       | 3      |
| University/State Core Fine Arts or Humanities requirement   |       | 3      |
| University/State Core Social Science requirement  |       | 3      |
| CHEM 22673 Analytical Chemistry Lecture & CHEM 22671 Analytical Chemistry Laboratory <sup>1</sup>   |       | 4      |
| Select one of the following:  |       | 4      |
| PHYS 20404 University Physics II (ACTS Equivalency = PHYS 2044 Lecture) <sup>1</sup>  |       |        |
| PHYS 20203 College Physics II (ACTS Equivalency = PHYS 2024 Lecture) & PHYS 20201 College Physics II Laboratory (ACTS Equivalency = PHYS 2024 Lab) <sup>1</sup> |       |        |
| Biology Elective  |       | 3      |
| University/State Core Humanities or Fine Arts requirement (as needed)   |       | 3      |
| University/State Core Social Science requirement  |       | 3      |
| Year Total:   | 17    | 17     |

| Third Year   | Units |        |
|--|-------|--------|
|  | Fall  | Spring |
| CHEM 37073 Organic Chemistry I Lecture for Chemistry Majors & CHEM 37072 Organic Chemistry I Lab for Chemistry Majors <sup>1,2</sup>   | 5     |        |
| Select one of the following:   | 4     |        |
| CHEM 34603 Elements of Physical Chemistry & CHEM 34601 Elements of Physical Chemistry Laboratory <sup>1,2</sup>                        |       |        |
| CHEM 35004 Physical Chemistry I  |       |        |
| Upper Level Biology Elective <sup>1,2</sup>  | 4     |        |
| General Electives  | 3     |        |
| CHEM 37203 Organic Chemistry II Lecture for Chemistry Majors & CHEM 37202 Organic Chemistry II Lab for Chemistry Majors <sup>1,2</sup> |       | 5      |
| Select one of the following:   |       | 6      |
| CHEM 35204 Physical Chemistry II & CHEM 35102 Physical Chemistry Laboratory <sup>1,2</sup>   |       |        |
| CHEM Electives 3000-4000 Level <sup>1,2</sup>  |       |        |
| General Elective   |       | 3      |

|             |    |    |
|-------------|----|----|
| Year Total: | 16 | 14 |
|-------------|----|----|

| Fourth Year   | Units |        |
|---|-------|--------|
|   | Fall  | Spring |
| CHEM 38103 Elements of Biochemistry <sup>1,2</sup><br>or CHEM 481H3 Honors Biochemistry I | 3     |        |
| CHEM 41203 Advanced Inorganic Chemistry I <sup>1,2</sup>                                  | 3     |        |
| General Electives   | 6     |        |
| CHEM 48503 Biochemical Techniques <sup>1,2</sup>  |       | 3      |
| Select one of the following:  |       | 3      |
| CHEM 484H3 Honors Biochemistry II <sup>1,2</sup>  |       |        |
| CHEM Elective 3000-4000 Level <sup>1,2</sup>  |       |        |
| General Electives   |       | 4      |
| Year Total:   | 12    | 10     |

|                                 |            |
|---------------------------------|------------|
| <b>Total Units in Sequence:</b> | <b>120</b> |
|---------------------------------|------------|

<sup>1</sup> Meets 40-hour advanced credit hour requirement. See College Academic Regulations on page 131 of this chapter

<sup>2</sup> Meets 24-hour rule (24 hours of 3000-4000 level courses in Fulbright College), in addition to meeting the 40-hour rule. See College Academic Regulations on page 131 of this chapter.

<sup>3</sup> Depending on placement; MATH 22003 Survey of Calculus is another option. Student may also choose to take MATH 13004 Precalculus in Fall Semester Year 1 and MATH 24004 Calculus in Spring Semester Year 1. Another option is to complete MATH 11003 in Fall Semester 1 and MATH 22003 Survey of Calculus in Spring Semester Year 1.

## Requirements for a Minor in Chemistry

|   |           |
|---|-----------|
| CHEM 22673 Analytical Chemistry Lecture<br>& CHEM 22671 and Analytical Chemistry Laboratory | 4         |
| CHEM 36053 Organic Chemistry I<br>& CHEM 36051 and Organic Chemistry I Laboratory           | 4         |
| CHEM 36203 Organic Chemistry II<br>& CHEM 36201 and Organic Chemistry II Laboratory         | 4         |
| CHEM 34603 Elements of Physical Chemistry   | 3         |
| A course at the 3000-4000 level.  | 3         |
| <b>Total Hours</b>  | <b>18</b> |

A student must notify the department of his or her intent to minor.

**Requirements for Departmental Honors in Chemistry:** Students with good academic backgrounds and strong interests in research are encouraged to participate in the department of chemistry and biochemistry honors program. Entrance into the program is normally during the sophomore year or the first semester of the junior year, and a minimum cumulative GPA of 3.5 is required. Entrance is initiated by consulting the faculty academic adviser, who will help arrange conferences with potential faculty research project advisers. When there is agreement between the student and the adviser on a research project or area, an Honors Advisory Committee is set up to supervise the honors candidate's program. The heart of the program is the research project, but students are encouraged to broaden their experience beyond required courses within chemistry, the natural sciences, the social sciences, and the humanities. Participation in Honors Colloquia, honors sections of regular courses, and chemistry departmental and divisional seminars is especially recommended. All honors candidates enroll in the spring semester Honors Seminar (CHEM 401H1), and senior honors students must make at

least one seminar presentation. All honors candidates will be required to complete and defend an honors thesis and take 12 hours (which may include 6 hours of thesis) in Honors Studies. The thesis is required in the spring semester of the senior year, followed by an oral presentation. On the basis of these written and oral reports and their evaluation of all aspects of the student's honor program, the candidate's Honors Advisory Committee will recommend whether or not the distinction "Chemistry or Biochemistry Scholar *Cum Laude*" should be awarded. Higher degree distinctions are recommended only in truly exceptional cases and are based upon the whole of the candidate's program of honors studies.

### Chemistry Teacher Licensure Requirements:

Students interested in pursuing a minor in STEM Education (<http://catalog.uark.edu/undergradcatalog/collegesandschools/collegeofeducationandhealthprofessions/stemeducation/#minorinstemeducationtext>) or a minor in STEM Education with Secondary Teacher Licensure in mathematics, biology, chemistry, physics, or computer science at the undergraduate level should consult with their assigned academic advisor or find more information at [stem.uark.edu](http://stem.uark.edu) (<http://stem.uark.edu>). Another option to obtain secondary teacher licensure is to complete the one-year Master of Arts in Teaching (<http://catalog.uark.edu/graduatecatalog/programsofstudy/teachereducation/>).

## Faculty

**Adams, Paul D.**, Ph.D. (Case Western Reserve University), B.S. (Louisiana State University), Professor, 2006, 2021.

**Allison, Neil T.**, Ph.D. (University of Florida), B.S. (Georgia College), Associate Professor, 1980.

**Chen, Jingyi**, Ph.D. (University of Washington), M.A. (State University College at Buffalo), B.S. (Zhongshan University), Professor, 2010, 2019.

**Chevrier, Vincent Francois**, Ph.D. (CEREGE, Aix-en-Provence, France), M.E.S. (University Paris VII), B.S. (Academy of Versailles, France), Research Associate Professor, 2005.

**Coridan, Robert**, Ph.D., M.S. (University of Illinois-Urbana-Champaign), B.S. (The Ohio State University), Professor, 2015, 2023.

**Dong, Bin**, Ph.D. (Iowa State University), B.S. (Xiamen University), Assistant Professor, 2021.

**Edwards, Martin**, Ph.D., M.Sc., M.Math. (University of Warwick), Assistant Professor, 2020.

**Fan, Chenguang**, Ph.D. (Iowa State University), B.S. (Nanjing University), Associate Professor, 2016, 2022.

**Fritsch, Ingrid**, Ph.D. (University of Illinois-Urbana-Champaign), B.S. (University of Utah), Professor, 1992, 2005.

**He, Maggie**, Ph.D. (ETH Zürich), M.S. (University of Pennsylvania), B.S. (City College of New York), Assistant Professor, 2019.

**Hershberger, Margaret**, Ph.D., M.S. (University of Chicago), B.S. (The Ohio State University), Teaching Assistant Professor, 2015, 2023.

**Heyes, Colin David**, Ph.D. (Georgia Institute of Technology), B.S. (Loughborough University), Professor, 2008, 2021.

**Kilyanek, Stefan M.**, Ph.D., M.S. (University of Chicago), B.S. (Grand Valley State University), Associate Professor, 2014, 2019.

**Lay, Jackson**, Ph.D. (University of Nebraska-Lincoln), Professor, 2002.

**Mazzanti, Christopher L.**, Ph.D., M.S. (University of Arkansas), B.S. (University of Arkansas at Monticello), Instructor, 2012.

**McIntosh, Matt**, Ph.D. (Pennsylvania State University), B.A. (Virginia Tech), Professor, 1996, 2011.

**Millett, Francis**, Ph.D. (Columbia University), B.S. (University of Wisconsin), Distinguished Professor, 1972, 2003.

**Moradi, Mahmoud**, Ph.D. (North Carolina State University), M.S., B.S. (Sharif University of Technology), Professor, 2015, 2023.

**Norman, Mya A.**, Ph.D. (University of Colorado-Boulder), M.S., B.S. (University of Arkansas), Instructor, 2006.

**Sakon, Joshua**, Ph.D. (University of Wisconsin-Madison), B.S. (Southern Oregon University), Professor, 1997, 2016.

**Stenken, Julie A.**, Ph.D. (University of Kansas), B.S. (University of Akron), Professor, 21st Century Chair of Proteomics, 2007.

**Striegler, Susanne**, Ph.D., M.S., B.S. (Ulm University, Germany), Professor, 2012, 2015.

**Thallapuram, Suresh**, Ph.D. (Osmania University), Professor, 2003, 2015.

**Tian, Ryan**, Ph.D. (University of Connecticut), B.S. (Fudan University, Shanghai), Professor, 2004, 2023.

**Wang, Feng**, Ph.D. (University of Pittsburgh), Ph.D. (Kutztown University of Pennsylvania), B.S. (Peking University), Distinguished Professor, Charles E. and Clydene Scharlau Endowed Professor, 2012, 2023.

**Wilkins, Charles L.**, Ph.D. (University of Oregon), B.S. (Chapman College), Distinguished Professor, 1998.

**Zheng, Nan**, Ph.D. (University of Michigan-Ann Arbor), M.S. (University of Rochester), B.S. (University of Science and Technology of China), Professor, 2008, 2021.

## Courses

### **CHEM 10001. Chemistry in the Modern World Laboratory (ACTS Equivalency = CHEM 1004 Lab). 1 Hour.**

Basic laboratory exercises involving measurements of mass and volume, acids and bases, hardness of water, energy content in fuel, sugar content in drinks, and radioactivity. Meets 2 hours per week. Corequisite: CHEM 10003. (Typically offered: Fall and Spring)

### **CHEM 10003. Chemistry in the Modern World (ACTS Equivalency = CHEM 1004 Lecture). 3 Hours.**

The impact of chemical developments upon contemporary society. Chemical problems of ecological, environmental, nutritional, economic, and sociological concern. Designed for non-science majors. Lecture 3 hours per week. Corequisite: CHEM 10001. (Typically offered: Fall and Spring)

### **CHEM 12071. Chemistry for Majors I Laboratory. 1 Hour.**

Laboratory exercises involving density, types of chemical reactions separations and chromatography, solubility, waters of hydration, freezing point depression, gas laws, and data interpretation. Laboratory notebooks are required as part of every experiment. Laboratory 3 hours per week. Students may not receive credit for both CHEM 12071 and CHEM 14101. Corequisite: CHEM 12073 and related course component drill for CHEM 12073. (Typically offered: Fall)

### **CHEM 12073. Chemistry for Majors I. 3 Hours.**

The first half of a two-semester course designed especially for students planning to major in chemistry or biochemistry. Students may not receive credit for both CHEM 12073 and CHEM 14103. Corequisite: CHEM 12071 and related course component drill section for CHEM 12073. Prerequisite: MATH 11003 or higher, or AP Calculus AB 3C or higher, or AP Calculus BC 4C or higher, or MATH 11003 CLEP with a score of 54 or higher, or UA Math Placement 46 or higher, or ACT MATH 22 or higher, or new SAT MATH 540/old SAT MATH 540 or higher. (Typically offered: Fall)

### **CHEM 12101. Fundamentals of Chemistry Laboratory (ACTS Equivalency = CHEM 1214 Lab). 1 Hour.**

Laboratory exercises in principles and practices of Fundamental Chemistry. Corequisite: CHEM 12103. (Typically offered: Fall)

### **CHEM 12103. Fundamentals of Chemistry (ACTS Equivalency = CHEM 1214 Lecture). 3 Hours.**

One-semester introductory-level general chemistry course introducing select fundamental concepts and related problem-solving for atomic and molecular structures, nomenclature, dimensional analysis, chemical reactions, chemical bonding, intermolecular forces, states of matter, solutions, acid-base reactions, redox reactions, kinetics, thermochemistry, and chemical equilibrium. Corequisite: CHEM 12101 and related course component drill section for CHEM 12103. (Typically offered: Fall and Summer)

### **CHEM 12281. Chemistry for Majors II Laboratory. 1 Hour.**

Qualitative and quantitative laboratory with data interpretation and exercises covering the topics of stoichiometry, thermodynamics, kinetics, chemical equilibrium, pH, and descriptive inorganic chemistry. Laboratory notebooks are required as part of every experiment. Laboratory 3 hours per week. Students may not receive credit for both CHEM 12281 and CHEM 14201. Corequisite: CHEM 12283 and related course component drill for CHEM 12283. (Typically offered: Spring)  
This course is equivalent to CHEM 14201.

### **CHEM 12283. Chemistry for Majors II. 3 Hours.**

The second half of a two-semester course designed specifically for students planning to major in chemistry or biochemistry. Students may not receive credit for both CHEM 12283 and CHEM 14203. Pre- or Corequisite: MATH 13004 or higher. Corequisite: CHEM 12281 and related course component drill section for CHEM 12283. Prerequisite: CHEM 12073 and CHEM 12071 (or CHEM 14103 and CHEM 14101). (Typically offered: Spring)  
This course is equivalent to CHEM 14203.

### **CHEM 14101. University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab). 1 Hour.**

Laboratory exercises involving density, types of chemical reactions separations and chromatography, solubility, waters of hydration, freezing point depression, gas laws, and data interpretation. Meets 3 hours per week for 1 hour credit. Pre- or Corequisite: CHEM 14103. (Typically offered: Fall, Spring and Summer)

### **CHEM 14103. University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture). 3 Hours.**

An introductory course for science, engineering or agriculture majors. Atomic structure, electron configurations and periodic properties, nomenclature and bonding in compounds, Lewis structure and resonance forms, molecular geometries and polarity, stoichiometry, solution chemistry and aqueous reactions, thermochemistry, gas laws and kinetic molecular theory. Corequisite: Drill component. Prerequisite: MATH 11003 or higher, or AP Calculus AB 3C or higher, or AP Calculus BC 4C or higher, or MATH 11003 CLEP 54 or higher, or UA Math Placement 46 or higher, or ACT MATH 22 or higher, or new SAT MATH 540/old SAT MATH 540 or higher. (Typically offered: Fall, Spring and Summer)

### **CHEM 14201. University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab). 1 Hour.**

Quantitative laboratory with data interpretation and exercises covering the topics of stoichiometry, thermodynamics, kinetics, chemical equilibrium, pH, and descriptive inorganic chemistry. Laboratory 3 hours per week. Upon completion of CHEM 14201 on the UAF campus with a grade of "C" or better, credit for CHEM 14101 can be requested. Corequisite: CHEM 14203 and related course component drill section for CHEM 14203. (Typically offered: Fall, Spring and Summer)

**CHEM 14203. University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture). 3 Hours.**

Introductory course for science, engineering or agriculture majors. Liquids, solids, intermolecular forces, phase diagrams, solution chemistry, solubility, colligative properties, chemical kinetics, chemical equilibria, acid-base equilibria, aqueous ionic equilibria, titrations, buffers, solubility equilibria, thermodynamics, electrochemistry, and nuclear chemistry. Lecture 3 hours per week. Corequisite: CHEM 14201 and related course component drill section for CHEM 14203. Prerequisite: CHEM 14103 (or CHEM 12073, or satisfactory performance on the chemistry proficiency exam) and MATH 11003 or higher, or AP Calculus AB 3C or higher, or AP Calculus BC 4C or higher, or MATH 11003 CLEP with a score of 54 or higher, or UA Math Placement 46 or higher, or ACT MATH 22 or higher, or new SAT MATH 540/old SAT Math 540 or higher. (Typically offered: Fall, Spring and Summer)

**CHEM 142H1. Honors University Chemistry II Laboratory. 1 Hour.**

Qualitative and quantitative laboratory with data interpretation and exercises covering the topics of stoichiometry, thermodynamics, kinetics, chemical equilibrium, pH, and descriptive inorganic chemistry. Laboratory notebooks are required as part of every experiment. Designed for students in the honors programs. Laboratory 3 hours per week. Corequisite: CHEM 142H3 and related course component drill for CHEM 142H3. (Typically offered: Fall and Spring)

This course is equivalent to CHEM 14201.

**CHEM 142H3. Honors University Chemistry II. 3 Hours.**

Presents the topics of periodicity, bonding, stoichiometry, thermodynamics, kinetics, and chemical equilibrium in detail. Lecture 3 hours per week. Students with satisfactory performance on the proficiency exam and who complete CHEM 142H3 on the UAF campus with a grade of "C" or better can request credit for CHEM 14103. Pre- or Corequisite: MATH 13004 or higher. Corequisite: CHEM 142H1 and related course component drill section for CHEM 142H3. Prerequisite: Honors candidacy and CHEM 14103 (or CHEM 12073, or satisfactory performance on the chemistry proficiency exam). (Typically offered: Fall, Spring and Summer)

This course is equivalent to CHEM 14203.

**CHEM 22671. Analytical Chemistry Laboratory. 1 Hour.**

Covers techniques of classical and instrumental methods of chemical separation and analysis. Laboratory 4 hours per week. Chemistry Majors/Minors must take analytical lecture and lab prior to any physical chemistry course. Chemistry Majors/Minors should take analytical lecture and lab together. Pre- or Corequisite: CHEM 22673. Prerequisite: (CHEM 14203 and CHEM 14201) or (CHEM 142H3 and CHEM 142H1) or (CHEM 12283 and CHEM 12281) or (CHEM 12103 and CHEM 12101) and MATH 11003 or higher, or AP Calculus AB 3C or higher, or AP Calculus BC 4C or higher, or CLEP College Algebra 54 or higher. (Typically offered: Fall and Spring)

**CHEM 22673. Analytical Chemistry Lecture. 3 Hours.**

Principles of chemical separations, analysis by classical and instrumental methods, and chemical equilibrium in physical and biological systems. Lecture 3 hours per week. Chemistry Majors/Minors must take analytical lecture and lab prior to any physical chemistry course. Chemistry Majors/Minors should take analytical lecture and lab together. Prerequisite: ((CHEM 14203 and CHEM 14201) or (CHEM 142H3 and CHEM 142H1) or (CHEM 12283 and CHEM 12281) or (CHEM 12103 and CHEM 12101)) and ((MATH 11003 or higher) or (AP Calculus AB 3C or higher) or (AP Calculus BC 4C or higher) or (MATH 11003 CLEP score of College Algebra 54 or higher) or (UA Math Placement 46 or higher) or (ACT MATH 22 or higher) or (old/new SAT MATH of 540 or higher)). (Typically offered: Fall and Spring)

**CHEM 26101. Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab). 1 Hour.**

A focus on properties of organic compounds as well as reactions of organic compounds with an emphasis on functional groups along with some classifications of certain types of compounds. Laboratory 3 hours per week. Corequisite: CHEM 26103 and related course component drill for CHEM 26103. (Typically offered: Fall, Spring and Summer)

**CHEM 26103. Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture). 3 Hours.**

One semester survey of organic chemistry necessary for understanding of biological systems, with some related physiological chemistry. Lecture 3 hours per week. Corequisite: CHEM 26101 and related course component drill section for CHEM 26103. Prerequisite: (CHEM 12103 and CHEM 12101) or (CHEM 14203 and CHEM 14201) or (CHEM 142H3 and CHEM 142H1) or (CHEM 12283 and CHEM 12281). (Typically offered: Fall, Spring and Summer)

**CHEM 32003. Forensic Chemistry. 3 Hours.**

Survey of chemistry used in criminal investigations. Topics may include detection and identification of drugs, alcohol, toxins, explosives and gun powder residue. Chemical analysis of paint, ink, paper, soil, glass and fibers. Chemical detection of blood and fingerprints. Extraction of DNA from evidence, DNA fingerprinting. Prerequisite: CHEM 26103, or CHEM 36203 (recommended), or CHEM 362H3, or CHEM 37203. (Typically offered: Irregular)

**CHEM 32703. Inquiry and Modeling in Science Education. 3 Hours.**

Study of science practices with emphasis on modeling and inquiry for learning/teaching. Includes practical, philosophical, cognitive, and disciplinary specific dimensions of doing science in academic and nonacademic settings. Includes planning and implementing multiple scientific inquiries, engaging in reflective practices, writing and presenting scientific information. Safety and ethical issues are included. Corequisite: Drill component. Prerequisite: 8 hours of CHEM courses. (Typically offered: Fall and Spring)

This course is cross-listed with PHYS 32703, BIOL 32773.

**CHEM 34601. Elements of Physical Chemistry Laboratory. 1 Hour.**

Experimental measurements of the physical properties, chemical systems, error analysis and report writing. Experiments cover topics in thermochemistry, heat capacity, chemical kinetics, spectroscopy, and phase/chemical equilibrium using a variety of physical chemistry techniques. Laboratory 3 hours per week. Corequisite: Chemistry majors and chemistry minors must enroll in CHEM 34603 concurrently. Prerequisite: CHEM 22671 and PHYS 20201 (or PHYS 20404). (Typically offered: Fall)

**CHEM 34603. Elements of Physical Chemistry. 3 Hours.**

One semester accelerated course in physical chemistry primarily for students majoring/minoring in chemistry with biochemistry option, or pre-professional and agriculture students. Topics include thermodynamics, phase & chemical equilibrium, chemical kinetics, quantum chemistry and spectroscopy. Presented at the same level as the 2-semester course with some recourse to calculus, although covering fewer topics in quantum chemistry. Lecture 3 hours per week. Students cannot earn credit for both CHEM 34603 and CHEM 35204. Corequisite: Chemistry majors and chemistry minors must enroll in CHEM 34601 concurrently. Prerequisite: CHEM 22673 and PHYS 20203 (or PHYS 20404), and MATH 24004 (or MATH 22003). (Typically offered: Fall)

**CHEM 35004. Physical Chemistry I. 4 Hours.**

First semester of a 2-semester course in physical chemistry designed for chemistry majors and chemistry minors with topics covering wave-particle duality, quantum chemistry, atomic and molecular structure, bonding, spectroscopy and elementary statistical mechanics. Lecture and recitation 4 hours per week. Pre- or Corequisite: MATH 25004. Prerequisite: CHEM 22673 and PHYS 20404. (Typically offered: Fall)

**CHEM 35102. Physical Chemistry Laboratory. 2 Hours.**

Experimental studies of molecular structure, thermochemistry, and chemical kinetics, and the determination of other physicochemical properties of matter. Laboratory 8 hours per week. Students cannot earn credit for both CHEM 34601 and CHEM 35102. Corequisite: Chemistry majors and chemistry minors must take CHEM 35204 concurrently. Prerequisite: CHEM 22671 and PHYS 20201 (or PHYS 20404). (Typically offered: Spring)

**CHEM 35204. Physical Chemistry II. 4 Hours.**

Second semester of a 2-semester course in physical chemistry aimed for B.S. chemistry majors/minors with topics covering the laws of thermodynamics, phase & chemical equilibria; structure and properties of solutions, chemical potential, and chemical kinetics. Lecture and recitation 4 hours per week. Students cannot earn credit for both CHEM 34603 and CHEM 35204. Corequisite: Chemistry majors and chemistry minors must enroll in CHEM 35102 concurrently. Prerequisite: CHEM 35004. (Typically offered: Spring)

**CHEM 36051. Organic Chemistry I Laboratory. 1 Hour.**

Introduction to basic techniques for separation, purification, and identification of organic compounds. Laboratory exercises in organic chemistry. Meets 3 hours per week. Corequisite: CHEM 36053 and related course component drill for CHEM 36053. (Typically offered: Fall and Summer)  
This course is equivalent to CHEM 36001.

**CHEM 36053. Organic Chemistry I. 3 Hours.**

Introduction to organic compounds including alkanes, haloalkanes, alkenes and alkynes; properties including basic stereochemistry and reactions including nucleophilic substitution, elimination, and electrophilic addition reactions. Lecture 3 hours per week. Corequisite: CHEM 36051 and related course component drill section for CHEM 36053. Prerequisite: (CHEM 14203 and CHEM 14201) or (CHEM 142H3 and CHEM 142H1) or (CHEM 12283 and CHEM 12281). (Typically offered: Fall and Summer)

**CHEM 360H2. Honors Organic Chemistry I Laboratory. 2 Hours.**

Introduction to basic techniques for separation, purification, and identification of organic compounds. Drill lecture-discussion (1hr/wk) and laboratory (4hr/wk). Writing component. Required drill. Corequisite: CHEM 360H3 and related drill components. Prerequisite: Honors candidacy. (Typically offered: Fall and Summer)  
This course is equivalent to CHEM 36001.

**CHEM 360H3. Honors Organic Chemistry I. 3 Hours.**

In-depth introduction to organic compounds; properties and reactions. Including alkanes, haloalkanes, alkenes and alkynes; nucleophilic substitution, elimination, and electrophilic addition reactions. Lecture 3 hours per week. Corequisite: CHEM 360H2 and related course component drill sections for CHEM 360H3 and CHEM 360H2. Prerequisite: Honors candidacy and ((CHEM 14203 and CHEM 14201) or (CHEM 142H3 and CHEM 142H1) or (CHEM 12283 and CHEM 12281)). (Typically offered: Fall and Summer)  
This course is equivalent to CHEM 36053.

**CHEM 36201. Organic Chemistry II Laboratory. 1 Hour.**

Continuation of CHEM 36051 and introduction to basic techniques of synthesis, isolation, and determination of structure and reactivity of organic compounds. Laboratory exercises in organic chemistry. Meets 3 hours per week. Corequisite: CHEM 36203 and related course component drill for CHEM 36203. Prerequisite: CHEM 36051. (Typically offered: Spring and Summer)

**CHEM 36203. Organic Chemistry II. 3 Hours.**

Basic chemistry of aromatic and carbonyl compounds: properties and reactions. Lecture 3 hours per week. Corequisite: CHEM 36201 and related course component drill section for CHEM 36203. Prerequisite: (CHEM 36053 and CHEM 36051) or (CHEM 360H3 and CHEM 360H2) or (CHEM 37073 and CHEM 37072). (Typically offered: Spring and Summer)

**CHEM 362H2. Honors Organic Chemistry II Laboratory. 2 Hours.**

Continuation of CHEM 360H2 and introduction to basic techniques of synthesis, isolation, and determination of structure and reactivity of organic compounds. Drill lecture-discussion (1 hour/wk) and laboratory (4 hours/wk). Writing component. Drill required. Corequisite: CHEM 362H3 and related course component drill sections for CHEM 362H2 and CHEM 362H3. Prerequisite: Honors candidacy and CHEM 360H2. (Typically offered: Spring and Summer)  
This course is equivalent to CHEM 36201.

**CHEM 362H3. Honors Organic Chemistry II. 3 Hours.**

In-depth coverage of the basic chemistry of aromatic and carbonyl compounds; properties and reactions. Lecture 3 hours per week. Corequisite: CHEM 362H2 and related course component drill sections for CHEM 362H3 and CHEM 362H2. Prerequisite: Honors candidacy and CHEM 360H3 and CHEM 360H2. (Typically offered: Spring and Summer)  
This course is equivalent to CHEM 36203.

**CHEM 37072. Organic Chemistry I Lab for Chemistry Majors. 2 Hours.**

Introduction to basic techniques for separation, purification, and identification of organic compounds. Drill lecture-discussion (1hr/wk) and laboratory (4hr/wk). Writing component. Required drill. Corequisite: CHEM 37073 and related course component drill sections for CHEM 37073 and CHEM 37072. Prerequisite: Chemistry major or minor. (Typically offered: Fall)

**CHEM 37073. Organic Chemistry I Lecture for Chemistry Majors. 3 Hours.**

In-depth introduction to organic compounds including alkanes, haloalkanes, alkenes and alkynes; properties including basic stereochemistry and reactions including nucleophilic substitution, elimination, and electrophilic addition. Lecture 3 hours per week. Corequisite: CHEM 37072 and related course component drill sections for CHEM 37073 and CHEM 37072. Prerequisite: Chemistry major or minor and (CHEM 14203 and CHEM 14201) or (CHEM 142H3 and CHEM 142H1) or (CHEM 12283 and CHEM 12281). (Typically offered: Fall)  
This course is equivalent to CHEM 36053.

**CHEM 37202. Organic Chemistry II Lab for Chemistry Majors. 2 Hours.**

Continuation of CHEM 37072 and introduction to basic techniques of synthesis, isolation, and determination of structure and reactivity of organic compounds. Drill lecture-discussion (1 hour/wk) and laboratory (4 hours/wk). Writing component. Drill required. Corequisite: CHEM 37203 and related course component drill sections for CHEM 37203 and CHEM 37202. Prerequisite: Chemistry major or minor and CHEM 37072. (Typically offered: Spring)

**CHEM 37203. Organic Chemistry II Lecture for Chemistry Majors. 3 Hours.**

Continuation of in-depth coverage of the basic chemistry of the compounds of carbon. Properties and reactions of aromatic and carbonyl functional groups. Lecture 3 hours per week. Corequisite: CHEM 37202 and related course component drill sections for CHEM 37203 and CHEM 37202. Prerequisite: Chemistry major or minor and CHEM 37073 and CHEM 37072. (Typically offered: Spring)  
This course is equivalent to CHEM 36203.

**CHEM 38103. Elements of Biochemistry. 3 Hours.**

One semester survey course of the fundamentals of biochemistry. Structures, properties, and reactions of major classes of biomolecules. Basics of enzyme catalysis. Overview of metabolism. Credit for both CHEM 38103 and CHEM 481H3 may not be counted toward a chemistry degree. Lecture 3 hours per week. Prerequisite: (CHEM 36203 and CHEM 36201) or (CHEM 362H3 and CHEM 362H2) or (CHEM 37203 and CHEM 37202) or (CHEM 26103 and CHEM 26101). (Typically offered: Fall, Spring and Summer)

**CHEM 392H3. Honors Colloquium. 3 Hours.**

Covers a special topic or issue. Offered as a part of the honors program. Prerequisite: Honors candidacy. (Typically offered: Fall, Spring and Summer)

**CHEM 4000V. Chemistry Research. 1-4 Hour.**

Research problems. Students need to enroll in their supervising faculty mentor's section. CHBC students conducting research under a faculty mentor outside of CHBC must enroll in the CHBC chair's section. Additionally, honors students need the approval of the CHBC department honors advisor. Honors students must complete thesis in senior year. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.

**CHEM 400HV. Honors Chemistry Research. 1-4 Hour.**

Research problems. Students need to enroll in their supervising faculty mentor's section. CHBC students conducting research under a faculty mentor outside of CHBC must enroll in the CHBC chair's section. Additionally, honors students need the approval of the CHBC department honors advisor. Honors students must complete thesis in senior year. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.

This course is equivalent to CHEM 4000V.

**CHEM 401H1. Honors Seminar. 1 Hour.**

Research seminar for chemistry majors enrolled in the honors program. Enrollment is required the spring semester of the junior and senior years for honors students. Senior honors students must make one research presentation to graduate with honors. Prerequisite: Honors candidacy, chemistry major and junior or senior standing. (Typically offered: Spring) May be repeated for up to 2 hours of degree credit.

**CHEM 4050V. Special Topics in Chemistry. 1-4 Hour.**

Potential topics include: advanced spectroscopic methods, bioanalytical chemistry, bioinorganic chemistry, bioorganic chemistry, biophysical chemistry, chemical sensors, drug discovery and design, nanomaterials, pharmaceutical chemistry, process analytical chemistry, and protein folding and design. (Typically offered: Irregular)

**CHEM 41203. Advanced Inorganic Chemistry I. 3 Hours.**

Reactions and properties of inorganic compounds from the standpoint of electronic structure and the periodic table. Emphasis on recent developments. Prerequisite: CHEM 34603 or CHEM 35204. (Typically offered: Fall)

**CHEM 42101. Instrumental Analysis Laboratory. 1 Hour.**

Provides laboratory experience in parallel with the lecture material in CHEM 42203. Laboratory 3 hours per week. Corequisite: CHEM 42203. (Typically offered: Fall and Spring)

**CHEM 42203. Instrumental Analysis. 3 Hours.**

Provides students, especially those in the agricultural, biological, and physical sciences, with an understanding of modern instrumental techniques of analysis. Lecture 3 hours per week. Corequisite: CHEM 42101. Prerequisite: (CHEM 22673 and CHEM 22671) and ((CHEM 36203 and CHEM 36201) or (CHEM 362H3 and CHEM 362H2) or (CHEM 37203 and CHEM 37202)). (Typically offered: Fall and Spring)

**CHEM 42803. Energy Conversion and Storage. 3 Hours.**

Fundamental and applied concepts of energy storage and conversion, with sustainability implications. Chemical reactions (kinetics, thermodynamics, mass transfer), emphasizing oxidation-reduction, electrochemical, and interfacial processes, and impact on performance of fuel and biofuel cells, batteries, supercapacitors, and photochemical conversion. Prerequisite: CHEM 14203 and PHYS 20404. (Typically offered: Fall Even Years)

**CHEM 47203. Experimental Methods in Organic Chemistry. 3 Hours.**

Introduction to the application of synthetic and spectroscopic methods in organic chemistry, including mass spectrometry, infrared spectroscopy, and nuclear magnetic resonance spectrometry. Other laboratory techniques applicable to chemical research will be included. Lecture 3 hours and laboratory 3 hours per week. Lecture only meets the first half of the term. Laboratory meets the entire term. Corequisite: Lab component. Prerequisite: CHEM 36203 and CHEM 36201, (or CHEM 362H3 or CHEM 361H1), (or CHEM 37203 and CHEM 37202). (Typically offered: Fall)

**CHEM 481H3. Honors Biochemistry I. 3 Hours.**

The first of a two-course series covering biochemistry for undergraduate students in biology, agriculture, and chemistry. Topics covered include protein structure and function, enzyme kinetics, enzyme mechanisms, and nucleic acid and carbohydrate structures. Credit cannot be earned in both CHEM 38103 and CHEM 481H3.

Additional honors-level work required in this section. Prerequisite: Honors candidacy and (CHEM 36203 and CHEM 36201) or (CHEM 362H3 and CHEM 362H2) or (CHEM 37203 and CHEM 37202). (Typically offered: Fall)

**CHEM 484H3. Honors Biochemistry II. 3 Hours.**

A continuation of CHEM 481H3 covering topics including biological membranes and bioenergetics, photosynthesis, lipids and lipid metabolism, nucleic acid structure, structure and synthesis, and molecular biology. Credit cannot be earned in both CHEM 38103 and CHEM 484H3. Additional honors-level work required in this section. Prerequisite: Honors candidacy and CHEM 481H3. (Typically offered: Spring)

**CHEM 48503. Biochemical Techniques. 3 Hours.**

Techniques for handling, purifying and analyzing enzymes, structural proteins, and nucleic acids. Lecture 1 hour, laboratory 6 hours per week. Corequisite: Lab component. Pre or Corequisite: CHEM 38103 or CHEM 484H3. (Typically offered: Spring)