TRANSMITTAL for UNDERGRADUATE PROGRAMS: Changes or Proposals

INFORMATION

1. Program title: Chemistry Major
2. Department(s): Chemistry
3. College(s): Cas
4. Proposal prepared by: Barb Nielsen Date: 2/16/2012

5. Check all that apply:
   - [ ] New program
   - [ ] Change in course name
   - [x] Change in Major
   - [ ] Change in course content
   - [x] Existing program
   - [x] Change in number of credits
   - [ ] Change in Minor
   - [x] Change in Emphasis/Option

6. Other Programs/Departments Consulted (Requires letters of support from all Departments or Programs substantially affected):
   1.
   2.
   3.
   4.

7. Date of Implementation: Fall Semester 2012 Year

8. Have all courses in this program been approved? "Yes" [ ] "No" [x] If "No," which ones? CHEM 261 and CHEM 322

9. Attach Request Narrative. (Include description of program before and after proposed changes).

UNIT APPROVALS: Requires signatures of all Departments Chairs and Deans whose programs will be affected by the changes or proposal. Signature lines for the affected Departments and Colleges (Noted in 6 above), are on the back of this form. These signatures should be obtained prior to review by all other shared governance levels.

<table>
<thead>
<tr>
<th>Position</th>
<th>Signature</th>
<th>Date</th>
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<tbody>
<tr>
<td>Department Chair</td>
<td>Karl P. Peter</td>
<td>2-27-12</td>
</tr>
<tr>
<td>College Curriculum Cmtt. Chair</td>
<td>Joe H. Smith</td>
<td>3/19/2012</td>
</tr>
<tr>
<td>Dean of College</td>
<td></td>
<td>3/19/2012</td>
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<tr>
<td>University Curriculum Cmtt. Chair</td>
<td>Barbara S. Nielsen</td>
<td>3/30/2012</td>
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<tr>
<td>Academic Policy &amp; Programs Cmtt. Chair</td>
<td></td>
<td>4/27/2012</td>
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<tr>
<td>Faculty Senate Chair</td>
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<tr>
<td>Provost/Vice Chancellor</td>
<td></td>
<td>7/24/12</td>
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<tr>
<td>Chancellor</td>
<td></td>
<td>7/2/12</td>
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NOTE: The master copy of this transmittal and accompanying documents must be filed in the Provost’s office upon final approval. The Provost’s office will notify all appropriate administrative offices [Registrar, Dean(s), and Department Chair(s)] of approvals and necessary actions to implement changes.

Rev. 11/08
Narrative for Conversion of Chemistry Majors to Broad Field Majors

The UWRF Chemistry Department seeks to convert the chemistry major to a broad field major and reduce the number of subplans. In order for a major to be considered "broad field" it must have 56-60 credits, not all of which are from the major department. Due to the increased credit load, students completing a broad field major are not required to declare a minor area of study. Additionally, we seek to revise the course requirements for the Chemistry Education major.

The Chemistry Department is accredited by the American Chemical Society (ACS) and the programs we offer follow guidelines set by the ACS Committee on Professional Training (CPT). In order to meet the current guidelines, the Chemistry Department proposes to make essential changes to the various Chemistry major subplans. These changes involve decreasing the number of major subplans, providing more flexibility in upper division course offerings, counting courses from outside the Chemistry Department, streamlining the total number of credits by allowing more credits from the major and supporting courses to double count in the General Education requirement, and ensuring transparency in the course requirements (i.e., no "hidden" pre-requisites). This built-in efficiency will effectively reduce the credits to degree for chemistry majors. In addition, CHEM 378: Study Abroad is included as an in-depth elective, acknowledging the University’s mission to help prepare students to be engaged citizens with an informed global perspective.

The two guidelines driving the Chemistry Department’s decision to evaluate and update our curriculum stem from the new curricular requirements and the need for the development of specific student skills. The curricular requirements should provide a foundation in the five chemistry subdisciplines of Analytical, Biochemistry, Inorganic, Organic, and Physical Chemistry. Additionally, students should have in-depth courses to build on this foundation and 400 laboratory hours beyond general chemistry, some of which may be in the form of independent research. The areas and content covered in these in-depth courses are flexible, but a department must offer at least four annually. Further, effective student skills in problem solving, oral and written communication, the use of chemical literature, laboratory safety, teamwork, and the ethical practice of science are emphasized in the guidelines.

Currently the Chemistry Department offers two Chemistry majors. The first is Chemistry (with six subplans) and the second is Chemistry Education. The six subplans for the Chemistry major include: Liberal Arts (LA) Chemistry, ACS Chemistry, ACS Biochemistry, LA Biochemistry, ACS Polymer Option 1, and ACS Polymer Option 2. We propose to decrease the number of subplans in the Chemistry major to three: Chemistry ACS, Biochemistry ACS, and Biochemistry - Pre-Professional. The additional subplans are not necessary because the CPT no longer recognizes "options" within the majors and no longer requires the courses that differentiated the subplans. A comparison of the current Chemistry major and the proposed is shown in Table 1. By rearranging the array of in-depth elective courses, we are reducing the number of subplans and giving students more flexibility in devising their individualized Chemistry major.
Table 1. Comparison of current Chemistry major and the proposed Chemistry major.

<table>
<thead>
<tr>
<th>Current Chemistry Major</th>
<th>Proposed Chemistry Major</th>
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<tbody>
<tr>
<td>Liberal Arts (LA) Chemistry (Regular)</td>
<td>Chemistry - ACS</td>
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<tr>
<td>ACS Chemistry</td>
<td>Biochemistry - ACS</td>
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<tr>
<td>ACS Chemistry: Biochemistry Option</td>
<td>Biochemistry - Pre-Professional</td>
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<tr>
<td>ACS Chemistry: Polymer Option 1</td>
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<tr>
<td>ACS Chemistry: Polymer Option 2</td>
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<tr>
<td>LA Biochemistry</td>
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In general, the format for the proposed subplans includes required courses, in-depth electives, and required supporting courses. The Chemistry Education major is modified to incorporate these curricular changes, following the same general format with additional requirements imposed by the Secondary Education Major.
The Chemistry-ACS major is offered for those students who wish to pursue a more intensive program in chemistry approved by the American Chemical Society. This program is particularly recommended for students who intend to go to graduate school or work in the chemical industry. There are two equivalent tracks for this major, Track A and Track B.

(Current) Chemistry - ACS Chemistry Major (44-45 cr. hrs.)
(64-65 cr. hrs. including required supporting courses)
(includes 3 “hidden credits”)

**Track A Requirements: 40-41 cr. hrs.**

- CHEM 121 General Chemistry I (5 cr) or
  - CHEM 120 Introduction to General Chemistry (6 cr)
- CHEM 122 General Chemistry II (5 cr)
- CHEM 231 Organic Chemistry I (3 cr)
- CHEM 232 Organic Chemistry II (3 cr)
- CHEM 236 Organic Chemistry Lab I (1 cr)
- CHEM 237 Organic Chemistry Lab II (1 cr)
- CHEM 250 Foundations of Analytical Chemistry (4 cr)
- CHEM 341 Chemical Thermodynamics and Kinetics (3 cr)
- CHEM 342 Molecular Structure and Spectroscopy (3 cr)
- CHEM 355 Separation Science Laboratory (1 cr)
- CHEM 356 Chemical Instrumentation Lab (writing intensive) (1 cr)
- CHEM 361 Biochemistry I (3 cr)*
- CHEM 401 Advanced Chemistry Lab I (writing intensive) (1 cr)
- CHEM 402 Advanced Chemistry Lab II (writing intensive) (1 cr)
- CHEM 422 Advanced Inorganic Chemistry (writing intensive) (3 cr)
- CHEM 480 Chemical Communications and Research (writing intensive) (1 cr)
- CHEM 495 Undergraduate Research (1 cr)

**Track B Requirements: 40 cr. hrs.**

- CHEM 130 Introduction to Organic Chemistry (5 cr)
- CHEM 233 Foundations of Organic Chemistry (5 cr)
- CHEM 240 Foundations of Inorganic Chemistry (4 cr)
- CHEM 250 Foundations of Analytical Chemistry (4 cr)
- CHEM 333 Organic Synthesis (4 cr)
- CHEM 341 Chemical Thermodynamics and Kinetics (3 cr)
- CHEM 342 Molecular Structure and Spectroscopy (3 cr)
- CHEM 355 Separation Science Laboratory (1 cr)
- CHEM 356 Chemical Instrumentation Lab (writing intensive) (1 cr)
- CHEM 361 Biochemistry I (3 cr)*
- CHEM 401 Advanced Chemistry Lab I (writing intensive) (1 cr)
- CHEM 402 Advanced Chemistry Lab II (writing intensive) (1 cr)
- CHEM 422 Advanced Inorganic Chemistry (writing intensive) (3 cr)
- CHEM 480 Chemical Communications and Research (writing intensive) (1 cr)
- CHEM 495 Undergraduate Research (1 cr)
Directed Electives: 3 cr. hrs. Choose from:
CHEM 311 Polymer Chemistry (3 cr)
CHEM 362 Biochemistry II (3 cr)
CHEM 366 Biochemistry Laboratory (writing intensive) (1 cr)
CHEM 411 Polymer Science (3 cr)
CHEM 416 Polymer Laboratory (1 cr)
CHEM 432 Advanced Organic Chemistry (3 cr)
CHEM 489 Special Topics in Chemistry (0.5 -3 cr)

Required Supporting Courses: 21 cr. hrs.
MATH 166 Calculus I (4 cr)
MATH 167 Calculus II (4 cr)
MATH 266 Calculus III (3 cr)
PHYS 161/166 and PHYS 162/167 General Physics I,II (Lecture and Lab) (10 cr)

*CHEM 361 Biochemistry I (3 cr) requires BIOL 150 Introduction to Biology (3 cr)
In this proposed Chemistry ACS major, the changes are highlighted in bold text. Under **Requirements**, these changes include: the addition of two new courses (CHEM 261 and CHEM 322); the addition of BIOL 150 (a pre-requisite to CHEM 361); the option to take either CHEM 341 or CHEM 342; the inclusion of MATH 167; the option of a MATH elective instead of MATH 266; and the option to take either PHYS 151/156 and 152/157 or PHYS 161/166 and 162/167. Additionally, the proposal includes a larger array of **In Depth Electives**. Further, there is only one **Required Supporting Course** (MATH 166) which is a pre-requisite for the required MATH 167. As a required supporting course, MATH 166 meets the MATH requirement for General Education. There are two equivalent tracks for this major, Track A and Track B.

(Proposed) Chemistry - ACS Major (64-66 cr. hrs.)
(68-70 cr. hrs. including required supporting courses)
(includes NO “hidden credits”)

**Track A Requirements: 55-57 cr. hrs.**
CHEM 121 General Chemistry I (5 cr) or
   CHEM 120 Introduction to General Chemistry (6 cr)
CHEM 122 General Chemistry II (5 cr)
CHEM 231 Organic Chemistry I (3 cr)
CHEM 232 Organic Chemistry II (3 cr)
CHEM 236 Organic Chemistry Lab I (1 cr)
CHEM 237 Organic Chemistry Lab II (1 cr)
CHEM 250 Foundations of Analytical Chemistry (4 cr)
CHEM 261 Laboratory Safety (2 cr)
CHEM 322 Inorganic Chemistry (includes a 1 cr. lab portion) (4 cr)
CHEM 341 Chemical Thermodynamics and Kinetics (3 cr) OR
   CHEM 342 Molecular Structure and Spectroscopy (3 cr)
CHEM 361 Biochemistry I (3 cr)
CHEM 480 Chemical Communications and Research (writing intensive) (1 cr)
**Biol 150 Introduction to Biology (3 cr)**
MATH 167 Calculus II (4 cr)
**MATH elective (3-4 cr)**
PHYS 151/155 and PHYS 152/157 General Physics I, II (Lecture and Lab) (10 cr) OR
   PHYS 161/166 and PHYS 162/167 General Physics I,II (Calculus based Lecture and Lab (10 cr)

In Depth Electives: 9 credits (incl. at least 6 lab credits, one of which must be CHEM 366 or 402).
CHEM 311 Polymer Chemistry (3 cr)
CHEM 333 Organic Synthesis (4 cr)
CHEM 341 Chemical Thermodynamics and Kinetics (3 cr) OR
   CHEM 342 Molecular Structure and Spectroscopy (3 cr)
CHEM 355 Separation Science Laboratory (1 cr)
CHEM 356 Chemical Instrumentation Lab (writing intensive) (1 cr)
CHEM 362 Biochemistry II (3 cr)
CHEM 366 Biochemistry Laboratory (writing intensive) (1 cr)
CHEM 378 Semester Abroad (1-4 cr)
CHEM 379 Internship (1-4 cr)
CHEM 401 Advanced Chemistry Lab I (writing intensive) (1 cr)
CHEM 402 Advanced Chemistry Lab II (writing intensive) (1cr)
CHEM 411 Polymer Science (3 cr)
CHEM 416 Polymer Laboratory (1 cr)
CHEM 422 Advanced Inorganic Chemistry (writing intensive) (3 cr)
CHEM 461 Pharmacology (3 cr)
CHEM 489 Special Topics in Chemistry (1-4 cr)
CHEM 495 Undergraduate Research (1-3 cr)
BIOI. 451 Molecular Biology (4 cr)
PHYS 465 Quantum Mechanics (4 cr)

Required Supporting Courses: 4 cr. hrs.
MATH 166 Calculus I (4 cr)

** Math electives could include: MATH 236: Discrete Mathematics, MATH 256: Linear Algebra, MATH 326: Applied Statistics, MATH 346: Numerical Analysis I, or PHYS 361: Mathematics of Physics & Engineering. All have a pre-requisite no higher than MATH 167.

Track B Requirements: 55 - 56 cr. hrs.
CHEM 130 Introduction to Organic Chemistry (5 cr)
CHEM 233 Foundations of Organic Chemistry (5 cr)
CHEM 240 Foundations of Inorganic Chemistry (4 cr)
CHEM 250 Foundations of Analytical Chemistry (4 cr)
CHEM 261 Laboratory Safety (2 cr)
CHEM 322 Inorganic Chemistry (includes a 1 cr. lab portion) (4 cr)
CHEM 333 Organic Synthesis (4 cr)
CHEM 341 Chemical Thermodynamics and Kinetics (3 cr) OR
     CHEM 342 Molecular Structure and Spectroscopy (3 cr)
CHEM 361 Biochemistry I (3 cr)
CHEM 480 Chemical Communications and Research (writing intensive) (1 cr)
BIOL 150 Introduction to Biology (3 cr)
MATH 167 Calculus II (4 cr)
MATH elective (3-4 cr)*
PHYS 151/155 and PHYS 152/157 General Physics I, II (Lecture and Lab) (10 cr) OR
     PHYS 161/166 and PHYS 162/167 General Physics I,II (Calculus based Lecture and Lab) (10 cr)

In Depth Electives: 9 credits (incl. at least 3 lab credits, one of which must be CHEM 366 or 402).
CHEM 311 Polymer Chemistry (3 cr)
CHEM 341 Chemical Thermodynamics and Kinetics (3 cr) OR
     CHEM 342 Molecular Structure and Spectroscopy (3 cr)
CHEM 355 Separation Science Laboratory (1 cr)
CHEM 356 Chemical Instrumentation Lab (writing intensive) (1 cr)
CHEM 362 Biochemistry II (3 cr)
CHEM 366 Biochemistry Laboratory (writing intensive) (1 cr)
CHEM 378 Semester Abroad (1-4 cr)
CHEM 379 Internship (1-4 cr)
CHEM 401 Advanced Chemistry Lab I (writing intensive) (1 cr)
CHEM 402 Advanced Chemistry Lab II (writing intensive) (1 cr)
CHEM 411 Polymer Science (3 cr)
CHEM 416 Polymer Laboratory (1 cr)
CHEM 422 Advanced Inorganic Chemistry (writing intensive) (3 cr)
CHEM 461 Pharmacology (3 cr)
CHEM 489 Special Topics in Chemistry (1-4 cr)
CHEM 495 Undergraduate Research (1-3 cr)
BIOL 451 Molecular Biology (4 cr)
PHYS 465 Quantum Mechanics (4 cr)

Required Supporting Courses: 4 cr. hrs.
MATH 166 Calculus I (4 cr)

**Math electives could include: MATH 236: Discrete Mathematics, MATH 256: Linear Algebra, MATH 326: Applied Statistics, MATH 346: Numerical Analysis I, or PHYS 361: Mathematics of Physics & Engineering. All have a pre-requisite no higher than MATH 167.
The ACS Biochemistry major is recommended for the student who plans to attend graduate school. Both biochemistry options are for those students who wish to pursue a career in biotechnology, the health sciences or who desire a strong background in the chemistry of biological systems. There are two equivalent tracks for this major, Track A and Track B.

**(Current) Chemistry: ACS Biochemistry Major (42-43 cr. hrs.)**
**(73-74 cr. hrs. including supporting courses)**
*(includes 7 “hidden credits”)*

**Track A Requirements: 42-43 cr. hrs.**
CHEM 121 General Chemistry I (5 cr) or
   CHEM 120 Introduction to General Chemistry (6 cr)
CHEM 122 General Chemistry II (5 cr)
CHEM 231 Organic Chemistry I (3 cr)
CHEM 232 Organic Chemistry II (3 cr)
CHEM 236 Organic Chemistry Lab I (1 cr)
CHEM 237 Organic Chemistry Lab II (1 cr)
CHEM 250 Foundations of Analytical Chemistry (4 cr)
CHEM 341 Chemical Thermodynamics and Kinetics (3 cr)
CHEM 342 Molecular Structure and Spectroscopy (3 cr)
CHEM 355 Separation Science Laboratory (1 cr)
CHEM 356 Chemical Instrumentation Lab (writing intensive) (1 cr)
CHEM 361 Biochemistry I (3 cr)*
CHEM 362 Biochemistry II (3 cr)
CHEM 366 Biochemistry Laboratory (writing intensive) (1 cr)
CHEM 401 Advanced Chemistry Lab I (writing intensive) (1 cr)
CHEM 422 Advanced Inorganic Chemistry (writing intensive) (3 cr)
CHEM 480 Chemical Communications and Research (writing intensive) (1 cr)

**Track B Requirements: 42 cr. hrs.**
CHEM 130 Introduction to Organic Chemistry (5 cr)
CHEM 233 Foundations of Organic Chemistry (5 cr)
CHEM 240 Foundations of Inorganic Chemistry (4 cr)
CHEM 250 Foundations of Analytical Chemistry (4 cr)
CHEM 333 Organic Synthesis (4 cr)
CHEM 341 Chemical Thermodynamics and Kinetics (3 cr)
CHEM 342 Molecular Structure and Spectroscopy (3 cr)
CHEM 355 Separation Science Laboratory (1 cr)
CHEM 356 Chemical Instrumentation Lab (writing intensive) (1 cr)
CHEM 361 Biochemistry I (3 cr)*
CHEM 362 Biochemistry II (3 cr)
CHEM 366 Biochemistry Laboratory (writing intensive) (1 cr)
CHEM 401 Advanced Chemistry Lab I (writing intensive) (1 cr)
CHEM 422 Advanced Inorganic Chemistry (writing intensive) (3 cr)
CHEM 480 Chemical Communications and Research (writing intensive) (1 cr)
Required Supporting Courses: 31 cr. hrs.
MATH 166 Calculus I (4 cr)
MATH 167 Calculus II (4 cr)
MATH 266 Calculus III (3 cr)
PHYS 161/166 and PHYS 162/167 General Physics I,II (Lecture and Lab) (10 cr)
BIOL 240 Cell and Molecular Biology (3 cr)
BIOL 350 Genetics and Evolution (writing intensive) (3 cr)
BIOL 451 Molecular Biology (4 cr)**

*CHEM 361 Biochemistry I (3 cr) requires BIOL 150 Introduction to Biology (3 cr)

**BIOL 451 Molecular Biology (4 cr) requires BIOL 324 Microbiology (4 cr)
In this proposed Biochemistry ACS major, the changes are highlighted in bold text. Under Requirements these changes include: the addition of two new courses (CHEM 261 and CHEM 322); the addition of BIOL 150 (a pre-requisite to CHEM 361) and BIOL 324 (a pre-requisite for BIOL 451); the option to take either CHEM 341 or CHEM 342; the inclusion of MATH 167; and the option to take either PHYS 151/156 and 152/157 or PHYS 161/166 and 162/167. Additionally, the proposal includes a larger array of In Depth Electives. Further, there is only one Required Supporting Course (MATH 166) which is a pre-requisite for the required MATH 167. As a required supporting course, MATH 166 meets the MATH requirement for General Education. There are two equivalent tracks for this major, Track A and Track B.

(Proposed) Biochemistry - ACS Major (73-75 cr. hrs.)
(77-79 cr. hrs. including required supporting courses)
(includes NO “hidden credits”)

**Track A Requirements: 70-71 cr. hrs.**
CHEM 121 General Chemistry I (5 cr) or
   CHEM 120 Introduction to General Chemistry (6 cr)
CHEM 122 General Chemistry II (5 cr)
CHEM 231 Organic Chemistry I (3 cr)
CHEM 232 Organic Chemistry II (3 cr)
CHEM 236 Organic Chemistry Lab I (1 cr)
CHEM 237 Organic Chemistry Lab II (1 cr)
CHEM 250 Foundations of Analytical Chemistry (4 cr)
CHEM 261 Laboratory Safety (2 cr)
CHEM 322 Inorganic Chemistry (includes a 1 cr. lab portion) (4 cr)
CHEM 341 Chemical Thermodynamics and Kinetics (3 cr) OR
   CHEM 342 Molecular Structure and Spectroscopy (3 cr)
CHEM 361 Biochemistry I (3 cr)
CHEM 362 Biochemistry II (3 cr)
CHEM 366 Biochemistry Laboratory (writing intensive) (1 cr)
CHEM 480 Chemical Communications and Research (writing intensive) (1 cr)
BIOL 150 Introduction to Biology (3 cr)
BIOL 240 Cell and Molecular Biology (3 cr)
BIOL 324 Microbiology (4 cr)
BIOL 350 Genetics and Evolution (writing intensive) (3 cr)
BIOL 451 Molecular Biology (4 cr)
MATH 167 Calculus II (4 cr)
PHYS 151/155 and PHYS 152/157 General Physics I, II (Lecture and Lab) (10 cr) OR
   PHYS 161/166 and PHYS 162/167 General Physics I,II (Calculus based Lecture and Lab (10 cr)

**In Depth Electives: At least 4 lab credits.** Choose from:
CHEM 333 Organic Synthesis (includes 2 cr. lab) (4 cr)
CHEM 341 Chemical Thermodynamics and Kinetics (3 cr) OR
   CHEM 342 Molecular Structure and Spectroscopy (3 cr)
CHEM 355 Separation Science Laboratory (1 cr)
CHEM 356 Chemical Instrumentation Lab (writing intensive) (1 cr)
**CHEM 378 Semester Abroad (1-4 cr)**
**CHEM 379 Internship (1-4 cr)**
CHEM 401 Advanced Chemistry Lab I (writing intensive) (1 cr)
CHEM 402 Advanced Chemistry Lab II (writing intensive) (1 cr)
CHEM 416 Polymer Laboratory (1 cr)
CHEM 422 Advanced Inorganic Chemistry (writing intensive) (3 cr)
**CHEM 461 Pharmacology (3 cr)**
CHEM 489 Special Topics in Chemistry (1-4 cr)
CHEM 495 Undergraduate Research (1-3 cr)

Required Supporting Courses: 4 cr. hrs.
MATH 166 Calculus I (4 cr)

Track B Requirements: 70 cr. hrs.
CHEM 130 Introduction to Organic Chemistry (5 cr)
CHEM 233 Foundations of Organic Chemistry (5 cr)
CHEM 240 Foundations of Inorganic Chemistry (4 cr)
CHEM 250 Foundations of Analytical Chemistry (4 cr)
**CHEM 261 Laboratory Safety (2 cr)**

**CHEM 322 Inorganic Chemistry (includes a 1 cr. lab portion) (4 cr)**
CHEM 333 Organic Synthesis (4 cr)
CHEM 341 Chemical Thermodynamics and Kinetics (3 cr) OR
   **CHEM 342 Molecular Structure and Spectroscopy (3 cr)**
CHEM 361 Biochemistry I (3 cr)
CHEM 362 Biochemistry II (3 cr)
CHEM 366 Biochemistry Laboratory (writing intensive) (1 cr)
CHEM 480 Chemical Communications and Research (writing intensive) (1 cr)
**BIOL 150 Introduction to Biology (3 cr)**
**BIOL 240 Cell and Molecular Biology (3 cr)**
**BIOL 324 Microbiology (4 cr)**
**BIOL 350 Genetics and Evolution (writing intensive) (3 cr)**
**BIOL 451 Molecular Biology (4 cr)**
MATH 167 Calculus II (4 cr)
PHYS 151/155 and PHYS 152/157 General Physics I, II (Lecture and Lab) (10 cr) OR
   PHYS 161/166 and PHYS 162/167 General Physics I,II (Calculus based Lecture and Lab (10 cr)

In Depth Electives: At least 3 lab credits. Choose from:
CHEM 355 Separation Science Laboratory (1 cr)
CHEM 356 Chemical Instrumentation Lab (writing intensive) (1 cr)
**CHEM 378** Semester Abroad (1-4 cr)
**CHEM 379** Internship (1-4 cr)
CHEM 401 Advanced Chemistry Lab I (writing intensive) (1 cr)
CHEM 402 Advanced Chemistry Lab II (writing intensive) (1 cr)
CHEM 416 Polymer Laboratory (1 cr)
CHEM 489 Special Topics in Chemistry (1-4 cr)
CHEM 495 Undergraduate Research (1-3 cr)

**Required Supporting Courses: 4 cr. hrs.**
MATH 166 Calculus I (4 cr)
This biochemistry option is for those students who wish to pursue a career in biotechnology, the health sciences or who desire a strong background in the chemistry of biological systems.

(Current) Chemistry: Liberal Arts Biochemistry Major (38-42 cr. hrs.)
(58-69 cr. hrs. including required supporting courses)
(includes 3 “hidden credits”)

Track A Requirements: 38-39 cr. hrs.
CHEM 121 General Chemistry I (5 cr) or
   CHEM 120 Introduction to General Chemistry (6 cr)
CHEM 122 General Chemistry II (5 cr)
CHEM 231 Organic Chemistry I (3 cr)
CHEM 232 Organic Chemistry II (3 cr)
CHEM 236 Organic Chemistry Lab I (1 cr)
CHEM 237 Organic Chemistry Lab II (1 cr)
CHEM 250 Foundations of Analytical Chemistry (4 cr)
CHEM 341 Chemical Thermodynamics and Kinetics (3 cr) and CHEM 342 Molecular Structure and Spectroscopy (3 cr) OR
   CHEM 340 Physical Chemistry of Biological Systems (3 cr) and CHEM 432 Advanced Organic Chemistry (3 cr)
CHEM 355 Separation Science Laboratory (1 cr)
CHEM 356 Chemical Instrumentation Lab (writing intensive) (1 cr) OR
   CHEM 495 Undergraduate Research (1 cr)
CHEM 361 Biochemistry I (3 cr)*
CHEM 362 Biochemistry II (3 cr)
CHEM 366 Biochemistry Laboratory (writing intensive) (1 cr)
CHEM 480 Chemical Communications and Research (writing intensive) (1 cr)

Track B Requirements: 42 cr. hrs.
CHEM 130 Introduction to Organic Chemistry (5 cr)
CHEM 233 Foundations of Organic Chemistry (5 cr)
CHEM 240 Foundations of Inorganic Chemistry (4 cr)
CHEM 250 Foundations of Analytical Chemistry (4 cr)
CHEM 333 Organic Synthesis (4 cr)
CHEM 341 Chemical Thermodynamics and Kinetics (3 cr)
CHEM 342 Molecular Structure and Spectroscopy (3 cr)
CHEM 355 Separation Science Laboratory (1 cr)
CHEM 356 Chemical Instrumentation Lab (writing intensive) (1 cr)
CHEM 361 Biochemistry I (3 cr)*
CHEM 362 Biochemistry II (3 cr)
CHEM 366 Biochemistry Laboratory (writing intensive) (1 cr)
CHEM 401 Advanced Chemistry Lab I (writing intensive) (1 cr)
CHEM 422 Advanced Inorganic Chemistry (writing intensive) (3 cr)
CHEM 480 Chemical Communications and Research (writing intensive) (1 cr)
Required Supporting Courses: 20 - 27 cr. hrs.
MATH 166 Calculus I (4 cr)
MATH 167 Calculus II (4 cr) (only required if CHEM 341 and CHEM 342 are chosen above)
MATH 266 Calculus III (3 cr) (only required if CHEM 341 and CHEM 342 are chosen above)
PHYS 151/156 and PHYS 152/157 General Physics I,II (Lecture and Lab) (10 cr) **OR**
PHYS 161/166 and PHYS 162/167 General Physics I,II (Calculus based Lecture and Lab) (10 cr)
BIOL 240 Cell and Molecular Biology (3 cr)
BIOL 350 Genetics and Evolution (writing intensive) (3 cr)

*CHEM 361 Biochemistry I (3 cr) requires BIOL 150 Introduction to Biology (3 cr)
In this proposed Biochemistry - Pre-Professional major, the changes are highlighted in bold text. Under **Requirements** these courses include: the addition of two new courses (CHEM 261 and CHEM 322); the addition of BIOL 150 (a pre-requisite to CHEM 361); replacement of the CHEM 340/422 or CHEM 341/342 option with just CHEM 340; and the option to take PHYS 151/156 and 152/157 or PHYS 161/166 and 162/167. Additionally, the proposal includes a larger array of **In Depth Electives**. Further, the only **Required Supporting Course** is MATH 166. As a Required Supporting Course, MATH 166 meets the MATH requirement for General Education. There are two equivalent tracks for this major, Track A and Track B.

**(Proposed) Biochemistry Pre-Professional Major (63-65)**  
**(67-69 cr. hrs. including required supporting courses)**  
**(includes NO “hidden credits”)**

**Track A Requirements: 55-57 cr. hrs.**

CHEM 121 General Chemistry I (5 cr) or
    CHEM 120 Introduction to General Chemistry (6 cr)
CHEM 122 General Chemistry II (5 cr)
CHEM 231 Organic Chemistry I (3 cr)
CHEM 232 Organic Chemistry II (3 cr)
CHEM 236 Organic Chemistry Lab I (1 cr)
CHEM 237 Organic Chemistry Lab II (1 cr)
CHEM 250 Foundations of Analytical Chemistry (4 cr)
CHEM 261 Laboratory Safety (2 cr)
CHEM 322 Inorganic Chemistry (includes a 1 cr. lab portion) (4 cr)
CHEM 340 Physical Chemistry of Biological Systems (3 cr)
CHEM 361 Biochemistry I (3 cr)
CHEM 362 Biochemistry II (3 cr)
CHEM 366 Biochemistry Laboratory (writing intensive) (1 cr)
CHEM 480 Chemical Communications and Research (writing intensive) (1 cr)
**BIOL 150 Introduction to Biology (3 cr)**
MATH elective (3-4 cr)
PHYS 151/155 and PHYS 152/157 General Physics I, II (Lecture and Lab) (10 cr) **OR**
    PHYS 161/166 and PHYS 162/167 General Physics I, II (Calculus based Lecture and Lab (10 cr)

**In Depth Electives: 8 credits minimum including least 3 lab credits.** Choose from:

CHEM 311 Polymer Chemistry (3 cr)
CHEM 333 Organic Synthesis (includes 2 cr. lab) (4 cr)
CHEM 341 Chemical Thermodynamics and Kinetics (3 cr) **OR**
    CHEM 342 Molecular Structure and Spectroscopy (3 cr)
CHEM 355 Separation Science Laboratory (1 cr)
CHEM 356 Chemical Instrumentation Lab (writing intensive) (1 cr)
**CHEM 378 Semester Abroad (1-4 cr)**
**CHEM 379 Internship (1-4 cr)**
CHEM 461 Pharmacology (3 cr)
CHEM 489 Special Topics in Chemistry (1-4 cr)
CHEM 495 Undergraduate Research (1-3 cr)
BIOL 350 Genetics and Evolution (writing intensive) (3 cr)
BIOL 451 Molecular Biology (4 cr)

Required Supporting Courses: 4 cr. hrs.
MATH 166 Calculus I (4 cr)

Track B Requirements: 51-52 cr. hrs.
CHEM 130 Introduction to Organic Chemistry (5 cr)
CHEM 233 Foundations of Organic Chemistry (5 cr)
CHEM 240 Foundations of Inorganic Chemistry (4 cr)
CHEM 250 Foundations of Analytical Chemistry (4 cr)
CHEM 261 Laboratory Safety (2 cr)
CHEM 322 Inorganic Chemistry (includes a 1 cr. lab portion) (4 cr)
CHEM 340 Physical Chemistry of Biological Systems (3 cr)
CHEM 361 Biochemistry I (3 cr)
CHEM 362 Biochemistry II (3 cr)
CHEM 366 Biochemistry Laboratory (writing intensive) (1 cr)
CHEM 480 Chemical Communications and Research (writing intensive) (1 cr)
BIOL 150 Introduction to Biology (3 cr)
MATH elective (3-4 cr)
PHYS 151/155 and PHYS 152/157 General Physics I, II (Lecture and Lab) (10 cr) OR
PHYS 161/166 and PHYS 162/167 General Physics I, II (Calculus based Lecture and Lab) (10 cr)

In Depth Electives: 13 credits minimum with at least 2 lab credits. Choose from:
CHEM 311 Polymer Chemistry (3 cr)
CHEM 333 Organic Synthesis (includes 2 cr. lab) (4 cr)
CHEM 341 Chemical Thermodynamics and Kinetics (3 cr) OR
CHEM 342 Molecular Structure and Spectroscopy (3 cr)
CHEM 355 Separation Science Laboratory (1 cr)
CHEM 356 Chemical Instrumentation Lab (writing intensive) (1 cr)
CHEM 378 Semester Abroad (1-4 cr)
CHEM 379 Internship (1-4 cr)
CHEM 401 Advanced Chemistry Lab I (writing intensive) (1 cr)
CHEM 402 Advanced Chemistry Lab II (writing intensive) (1 cr)
CHEM 411 Polymer Science (3 cr)
CHEM 416 Polymer Laboratory (1 cr)
CHEM 422 Advanced Inorganic Chemistry (writing intensive) (3 cr)
CHEM 461 Pharmacology (3 cr)
CHEM 489 Special Topics in Chemistry (1-4 cr)
CHEM 495 Undergraduate Research (1-3 cr)
BIOL 350 Genetics and Evolution (writing intensive) (3 cr)
BIOL 451 Molecular Biology (4 cr)

Required Supporting Courses: 4 cr. hrs.
MATH 166 Calculus I (4 cr)