TO: College of Arts and Sciences Curriculum Committee

FROM: Michael Carney, Chair
Department of Chemistry

DATE: September 13, 2012

RE: Program Changes

We request implementation of the following program changes which were approved by the Chemistry Department on May 2, 2012 with the next possible Undergraduate Catalog.

FROM: Chemistry Department program information we intend to revise is found on pages 100-102 of the 2012-13 Undergraduate Catalog.

TO:

Core Requirements for A.C.S. and Liberal Arts Chemistry Majors

<table>
<thead>
<tr>
<th>Chemistry Core:</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 115 OR 103 &amp; 104†</td>
<td>6</td>
</tr>
<tr>
<td>CHEM 213</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 218</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 325</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 326</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>21</td>
</tr>
</tbody>
</table>

Additional Required Courses:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 231 &amp; 232</td>
<td>10</td>
</tr>
<tr>
<td>MATH 114 &amp; 215</td>
<td>8</td>
</tr>
</tbody>
</table>

Total (Core + Mathematics/Physics) 39

† Only 6 credits of the Chemistry 103/104 sequence are credited to the major.

Capstone Experience for Chemistry Majors

The capstone experience is met by completing Chem 412 or Biol 412 for Biochemistry/Molecular Biology majors, by Chem 411 for Chemistry with Business Emphasis majors, and by Chem 420, Chem 438, Chem 453 or Chem 497 for other chemistry majors.

Comprehensive Major: Chemistry, A.C.S.

The emphases below provide the rigorous background of an A.C.S. certified degree with maximum flexibility.

General Emphasis (Code 100-XXX)

The General Emphasis is ideal for students seeking immediate employment in chemically related fields or who are uncertain about postgraduate work.
Requirements
In addition to the Chemistry Core and required Mathematics/Physics courses, students must complete the following course work:

CHEM 352 4
CHEM 433 & 434 8
Two of the following:
  CHEM 420, 438, 453 4
CHEM 444 3
Elective(s)† 3 minimum

22

Total (General) 61

Materials Science Emphasis (Code 100-XXX)
Chemistry students with an interest in the rapidly growing field of materials science can obtain a basic materials background with a strong foundation in chemistry. This could be especially useful for students interested in graduate work or employment in materials or polymer chemistry.

Requirements
In addition to the Chemistry Core and required Mathematics/Physics courses, students must complete the following course work:

CHEM 352 4
CHEM 433 & 434 8
MSCI 234 3
MSCI 355 4
MSCI 363 2
CHEM 420 2
MSCI 480 1

24

Total (Materials Science) 63

Biochemistry Emphasis (Code 100-XXX)
This emphasis is good preparation for students planning graduate study in biochemistry, biophysics or medicinal chemistry. In addition, this emphasis would provide an exceptionally rigorous pre-medical or pre-pharmacy program with suitable biology electives.

Requirements
In addition to the Chemistry Core and required Mathematics/Physics courses, students must complete the following course work:

CHEM 406 OR 433 4
CHEM 452 & 453 & 454 8
CHEM 420 & 438 4
CHEM 318 OR 361 3
Elective(s)† 3 minimum

22

Total (Biochemistry) 61
†Electives for the A.C.S. emphases include: 304, 318, 361, 397, 399, 401, 411, 426, 442, 444, 460, 491, 495, 497, 499.

**Comprehensive Major: Chemistry, Research Emphasis, Liberal Arts (Code 100-XXX)**

For students interested in a career as a professional research scientist, this emphasis provides the flexibility to begin advanced study and research as an undergraduate.

**Requirements**

In addition to the Chemistry Core and required Mathematics/Physics courses, students must complete the following course work:

- CHEM 352
- CHEM 433 & 434
- One of the following:
  - CHEM 420, 438, 453
- CHEM 397*
- CHEM 497
- Elective(s)†

* in development

Total (Research) 61

†Electives include: 304, 318, 361, 397, 399, 401, 411, 426, 442, 444, 460, 491, 495, 497, 499.

**Major: Chemistry, Liberal Arts (Code 100-201)**

This course of study is ideal for pre-medical or pre-pharmacy students or others requiring a minor or cluster of courses outside of chemistry.

**Requirements**

In addition to the Chemistry Core and required Mathematics/Physics courses, students must complete the following course work:

- CHEM 433 & 434
- CHEM 420 OR 438 OR 453
- Electives†

Total (Liberal Arts) 55

†Electives include: 304, 318, 352, 361, 397, 399, 401, 411, 426, 442, 444, 460, 491, 495, 497, 499.
Why:

The creation of Core Requirements for A.C.S. and Liberal Arts Chemistry Majors provides a consistent set of foundational courses for these chemistry majors. The Core Requirements were created using revised guidelines provided by the American Chemical Society-Committee on Professional Training (ACS-CPT), the agency that certifies our chemistry program. In turn, the revised ACS-CPT guidelines gave us the flexibility to construct majors and emphases to better match student scientific interests and career goals. The Core Requirements represents a common base upon which the revised majors and emphases are built.

The proposal to create three new A.C.S. certified emphases (General Emphasis, Materials Science Emphasis, and Biochemistry Emphasis) within the A.C.S. Comprehensive Major umbrella is important because it provides students with additional options to obtain an A.C.S. certified degree. We currently have only a handful of students complete the A.C.S. Comprehensive Major (100-006) each year. The current 100-006 program is a highly prescriptive pathway that is difficult to complete in a timely manner and does not allow students to tailor their academic plan to their career goals. In contrast, the three proposed emphases are more flexible (while still meeting ACS-CPT guidelines) and correspond to particularly attractive areas of chemistry and career options. Moreover, recipients of A.C.S. certified degrees are recognized as having received an extra level of laboratory instruction and content breadth that is valued within the chemical community. In order for our students to remain competitive with graduates from other institutions, our students need more opportunities to complete an A.C.S. certified major. The proposed emphases will provide those opportunities. If approved, the three emphases will result in the elimination of the current 100-006 program.

The proposal to create a new Research Emphasis in the Comprehensive Major: Chemistry, Liberal Arts, which will result in the elimination of the current 100-005 program, is important because it allows research active students to substitute independent study (Chem 397 and Chem 497) for a traditional advanced laboratory course (such as Chem 420 or Chem 438). Students participating in Chem 397 and 497 would be exposed to experimental techniques and intensive writing exercises currently provided in an advanced laboratory course, making the advanced laboratory course redundant. The Research Emphasis provides students, especially those who are interested in a research career, with a streamlined pathway to a comprehensive major that recognizes the rigor of their undergraduate research experiences.

The proposed revision to the Major: Chemistry, Liberal Arts (Code 100-201) is important because it provides pre-medical or pre-pharmacy students, or others requiring a minor or cluster of courses outside of chemistry, with a straightforward path to a chemistry major. Since students choosing this major are not likely (and would not be advised) to pursue graduate work in the chemical sciences, a single advanced laboratory course (Chem 420, 438 or 453) provides sufficient exposure to modern laboratory techniques and scientific writing principles.

In addition to the benefits and flexibilities described above, the proposed Comprehensive majors and emphases require 2-4 fewer credits to degree than the current Comprehensive programs (100-005 and 100-006). Furthermore, we expect the increased flexibility of the revised majors will reduce the overall demand for our upper level laboratory courses (like Chem 420, 438), which have grown to somewhat unwieldy (and probably unsustainable with current staffing) enrollments over the past five years.