Narrative for Changes to the Biotechnology Major

The Department of Chemistry is in the process of assuming the administration and assessment functions for the Biotechnology Program. Biotechnology will become one of three programs administered by the Department of Chemistry, including the following track options:

- Chemistry
  - Chemistry-ACS
  - Biochemistry-ACS
  - Biochemistry-Preprofessional
  - Chemistry-Dual Degree in Chemical Engineering
- Chemistry Education
  - Chemistry-Education
  - Chemistry-Broad Field Science Education
- Biotechnology

Part of this process included a review of the Biotechnology program curriculum. We herein propose changes to the program requirements. The rationale for the change includes:

1. Organizing the biotechnology program in a similar fashion to our broad field chemistry programs with required courses, required supporting courses and in-depth electives.
2. Streamlining the program to remove the areas of specialization which presented an undue administrative burden on advisors, administrators and students.
3. Including advanced communication courses in the in-depth electives based on feedback from our biotechnology alum.
4. The program is being revised to reflect the current landscape of course offerings by removing courses that are no longer taught and including courses that have been introduced since the previous program revision.

The Biotechnology program is being reorganized to have a similar structure to our chemistry programs, which include the required courses, required supporting courses (RSC), and in-depth elective courses. The new program will also have Track A and Track B to reflect the two different introductory chemistry options.

The new required courses are very comparable to a combination of the former core and RSC, save the following specific differences:

1. ANSC 257 no longer listed in an ‘or’ statement with BIOL 350, although ANSC 257 and CROP 257 could be allowed as substitutes for BIOL through program exception.
2. BIOT 280 is being eliminated from the new program, with the concomitant change in BIOT 380 from 0.5 cr. to 1 cr.
3. CHEM 246 and 247 are being removed as options. These courses are no longer offered.
4. FDSC 460 is being eliminated from the new program. The course is no longer being offered.
5. HORT 369 and BIOL 463 are being moved to a subcategory within the in-depth electives that also includes BIOL 464.
6. MATH 166 has been moved to the in-depth electives.
7. MATH 231 and ANSC 341 remain in the new RSC.

The former Biotechnology electives have been incorporated into the new in-depth electives.
The new RSC include a statistics course (MATH 231 or ANSC 341; see 7. above) and PHIL 220, which is a very desirable addition to the curriculum. PHIL 220 will also double-count in General Education Goal 5 EC.

The new in-depth electives will replace the former Biotechnology electives and the specialization area. The new in-depth electives area has a required subcategory for a course with tissue culture emphasis (see 5. above), along with 15 addition credits from a variety of options. The removal of the formal specialization will greatly remove an administrative burden for students and advisors, and will impart greater flexibility to students to tailor the program to their individual strengths and interests. We have also incorporated communication courses (COMS 318, ENGL 266, ENGL 367 and ENGL 371) on the advice of our Biotechnology alumni.
Current Biotechnology major

<table>
<thead>
<tr>
<th>Category</th>
<th>Credits</th>
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<tbody>
<tr>
<td>General Education</td>
<td>29-34 cr</td>
</tr>
<tr>
<td>Liberal Arts</td>
<td>9-11 cr</td>
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<tr>
<td>Major</td>
<td>78-81 cr</td>
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<td>6 cr</td>
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<td>23-25 cr</td>
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<td>9 cr</td>
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<tr>
<td>Completion</td>
<td>116-126 cr</td>
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Biotechnology Core: **40-41 cr. hrs.**

- ANSC 222 Introduction to Biotechnology 2 cr.
- BIOL 150 General 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.
  - or ANSC 257 Genetics 3 cr.
- BIOL 451 Molecular Biology 4 cr.
- BIOT 280 Sophomore Seminar 0.5 cr.
- BIOT 380 Junior Seminar 0.5 cr.
- BIOT 480 Biotech Seminar 1 cr.
- CHEM 231 Organic Chemistry I 3 cr.
- CHEM 232 Organic Chemistry II 3 cr.
- CHEM 236 Organic Chemistry Lab I 1 cr.
  - or CHEM 246 Synthetic & Analytical Techniques in Organic Chemistry I 2 cr.
- CHEM 237 Organic Chemistry Lab II 1 cr.
  - or CHEM 247 Synthetic & Analytical Techniques in Organic Chemistry II 1 cr.
- CHEM 355 Separation Science Laboratory 1 cr.
- CHEM 361 Biochemistry I 3 cr.
- CHEM 362 Biochemistry II 3 cr.
- CHEM 366 Biochemistry Lab 1 cr.
- FDSC 460 Fermentation Technology 3 cr.
  - or HORT 369 Plant Tissue Culture 3 cr.
  - or BIOL 463 Animal Cell Culture 3 cr.

Biotechnology Electives: **6 cr. hrs.**

Choose at least six credits from the following additional courses to obtain additional training in methods and content particularly relevant to biotechnology. Fermentation Technology, Animal Cell Culture or Plant Tissue Culture may be chosen as electives after one of the courses is completed as a core course (no double counting as core and elective).

- BIOL 345 Immunology 3 cr.
- BIOL 453 Virology 3 cr.
- BIOT/CSIS 373 Bioinformatics 3 cr.
- BIOT 295 Biotechnology Lab Research 1 cr.
- BIOT 379 Biotechnology Internship 1-4 cr.
- BIOT 495 Biotechnology Thesis 1-3 cr.
- FDSC 335 Food Microbiology 4 cr.
FDSC 460 Fermentation Technology 3 cr.
HORT 369 Plant Tissue Culture 3 cr.
BIOL 463 Animal Cell Culture 3 cr.

Required Supporting Courses: 23-25 cr. hrs.
MATH 166 Calculus I 4 cr.
or ANSC 341 Biometrics 3 cr.
or MATH 226 Fundamentals of Statistics 3 cr

CHEM 120 Introduction to General Chemistry 6 cr.
or CHEM 121 General Chemistry I 5 cr.
and CHEM 122 General Chemistry II 5 cr.

Either sequence A or B below:

A. PHYS 151 Algebra-Based Physics I 4 cr.
PHYS 152 Algebra-Based Physics II 4 cr.
PHYS 156 Algebra-Based Physics Laboratory I 1 cr.
PHYS 157 Algebra-Based Physics Laboratory II 1 cr.

B. PHYS 161 Calculus-Based Physics I 4 cr.
PHYS 162 Calculus-Based Physics II 4 cr.
PHYS 166 Calculus-Based Laboratory I 1 cr.
PHYS 167 Calculus-Based Laboratory II 1 cr.

Specialization Area: 9 cr. hrs.

In consultation with a biotechnology faculty advisor, the student will develop a plan that includes at least 9 additional credits of specialization. Up to four credits may include an internship in the specialization area. The total number of internship credits distributed between the Biotechnology Electives and Specialization Area may not exceed 4 credits. The plan will be submitted to the Biotechnology Program Director by the end of the first semester of the junior year for recording and approval. The senior seminar should focus on a research project the student worked on or a topic intimately related to the area of specialization.

Production Animal Biotechnology
Production Crop Biotechnology
Business/Management
Computational Biotechnology/Bioinformatics
Criminal Justice/Forensic Biotechnology
Environmental Biotechnology
Food Science Biotechnology
Industrial Biotechnology
Materials Science Biotechnology
Medical Biotechnology
Pharmaceutical Biotechnology
Veterinary Medical Biotechnology