

UNIVERSITY OF ILLINOIS  
AT URBANA-CHAMPAIGN

EP.02.30

Office of the Provost and Vice Chancellor  
for Academic Affairs

Swanlund Administration Building  
601 East John Street  
Champaign, IL 61820



March 12, 2002

R. Linn Belford, Chair  
Senate Committee on Educational Policy  
Office of the Senate  
228 English Building, MC-461

Dear Professor Belford:

Enclosed are copies of a proposal from the College of Liberal Arts and Sciences for the creation of the Major in Specialized Curriculum in Biomolecular and Chemical Engineering.

This proposal has been approved by the Committee on Courses and Curricula, Academic Affairs Committee, Executive Committee and the Faculty of the College of Liberal Arts and Sciences; it now requires Senate review.

Sincerely,

A handwritten signature in black ink that reads "Keith A. Marshall".

Keith A. Marshall  
Assistant Provost

KAM/ml1

c: C. Livingstone  
C. Zukoski  
T. Rauchfuss

UNIVERSITY OF ILLINOIS  
AT URBANA-CHAMPAIGN

EP.02.30

Office of the Dean

College of Liberal Arts and Sciences  
294 Lincoln Hall  
702 South Wright Street  
Urbana, IL 61801-3631



March 8, 2002

RECEIVED

MAR 12 2002

OFFICE of the PROVOST

Keith Marshall  
Assistant Provost  
Swanlund Administration Building  
MC-304

Dear Keith:

The Committee on Courses and Curricula, Academic Affairs Committee, Executive Committee and the Faculty of the College of Liberal Arts and Sciences has voted to approve the following proposal from the Department of Chemical Engineering:

Major in Specialized Curriculum in Biomolecular and Chemical Engineering

This proposal is now ready for review by the Senate Educational Policy Committee for proposed implementation August 2003.

Sincerely,

Ann M. Mester  
Assistant Dean

C: Prof. Charles Zukoski  
Prof. Thomas Rauchfuss

## PROPOSAL TO

## THE SENATE COMMITTEE ON EDUCATIONAL POLICY

Major in Specialized Curriculum in Biomolecular and Chemical Engineering  
Department of Chemical Engineering

**SPONSOR:** Charles F. Zukoski  
Professor and Head  
Department of Chemical Engineering  
244-9214  
czukoski@uiuc.edu

**BRIEF DESCRIPTION:**

The Department of Chemical Engineering, in conjunction with our proposed change of name to the Department of Chemical and Biomolecular Engineering, proposes to establish a Bachelor of Science degree in Biomolecular and Chemical Engineering (BmChE), to be offered as an alternative to the existing B.S. in Chemical Engineering (ChE). The new specialized curriculum builds upon the traditional principles of chemical engineering, but emphasizes biomolecular and biotechnological aspects in order to better prepare students who seek employment in the food, pharmaceutical, and biotechnology industries. The BmChE degree will require 129 credit hours, as does the ChE degree, for graduation. The proposed BmChE degree offers students a distinct course of study over the current ChE degree. Students seeking the BmChE degree are required to take BIOCH 350 instead of CHEM 336 in their sophomore year, select 9 hours from among Biomolecular Engineering courses, and at least 6 hours from the list of Bio-technical Electives.

**JUSTIFICATION:**

The discipline of Chemical Engineering has undergone rapid change in response to the shifting needs of the chemical process industry. The fraction of our graduates hired into the energy and petrochemical industry has decreased in recent years while the fraction going into the food, pharmaceutical and biotechnology industries has seen rapid growth. These industries clearly value the education imparted through the traditional chemical engineering curriculum, but increasingly seek students with both a core chemical engineering training and a knowledge of how to apply this knowledge to processes involving biomolecules.

The proposed degree has been developed in close consultation with faculty deeply involved with the development of the Bioengineering educational program. The chemical process emphasis clearly differentiates the BmChE degree from the Bioengineering degree.

**BUDGETARY AND STAFF IMPLICATIONS:**

- a. Additional staff and dollars needed.

None. The additional courses will be taught by current faculty.

- b. Internal reallocations (changes in class size, teaching loads, student-faculty ratio, etc.)

We expect that overall changes in enrollment in the department will be small. Rather, we anticipate that some students who would have chosen a ChE degree in the past will now choose the BmChE degree. The proposed curriculum will require two new courses in addition to two courses currently taught as electives with the department.

- c. Effect on course enrollments in other departments and explanations of discussions with representatives of those departments.

Students opting for the BmChE degree will be required to take Biochemistry 350. However, this class is currently an elective chosen by many of our students; approximately 20 ChEs enroll in BIOCH 350 each year (total enrollment in BIOCH 350 is ~600 per year). Thus the BmChE degree is expected to have only minor impact on this class. We have discussed this change with representatives of MCB who have given their approval.

- d. Impact on library, computer use, laboratory use, equipment, etc.

None

#### GUIDELINES FOR UNDERGRADUATE EDUCATION:

The proposed specialized curriculum in Biomolecular and Chemical Engineering will better prepare chemical engineering students for careers in the food, pharmaceutical, personal care, and biotechnology industries.

#### CLEARANCES:

Department/Unit Head

Date

School Approval

Date

College of Liberal Arts and Sciences

Date

Office of the Provost

Date

**STATEMENT FOR THE BULLETIN:**

*It is proposed to replace the current text in the Programs of Study Catalog under Chemical Engineering with the following text.*

Chemical and Biomolecular Engineering

MAJOR IN SPECIALIZED CURRICULUM IN CHEMICAL ENGINEERING

MAJOR IN SPECIALIZED CURRICULUM IN BIOMOLECULAR AND CHEMICAL ENGINEERING

Two degrees are available for students with interests in pursuing careers involving chemical and biomolecular technologies. These paths lead to a Bachelor of Science in Chemical Engineering and a Bachelor of Science in Biomolecular and Chemical Engineering. Both degrees emphasize fundamentals composed of a foundation in the humanities and social sciences, chemistry, physics, mathematics and biochemistry. On top of these courses lies a core of engineering fundamentals including thermodynamics, coupled heat mass, and energy transport phenomena, and molecular process design, control and optimization. The Bachelor of Science in Chemical Engineering is typically chosen by students with broad interests in chemical technology and applications of these technologies in the chemical, energy, semiconductor personal care and fiber industries. The Bachelor of Science in Biomolecular and Chemical Engineering is typically chosen by students wishing to specialize their education to include an in-depth knowledge of biomolecular processes such as those central to the biotechnology, pharmaceutical, and food industrial sectors.

Students in both programs must maintain a 2.5 general average, excluding military training, in order to be accepted by the Department as juniors and seniors.

For information regarding cooperative programs and internships the School of Chemical Sciences Placement and Student Services Office should be contacted.

Cooperative education programs and internships are available and information about these options are available in the School of Chemical Sciences Placement and Student Services Office.

General education: All campus general education requirements must be satisfied.

Minimum hours required for graduation: 129 hours including 16 hours of approved general education courses. This must include at least six hours in Social Perspectives or Behavioral Sciences and at least six hours in Literature and the Arts or Historical and Philosophical Perspectives. Students must satisfy the distribution requirements in Western and Non-Western Cultures.

Departmental distinction: A student is recommended for departmental distinction on the basis of grade point average and work presented in CH E 292-Senior Thesis.

## Major in Specialized Curriculum in Biomolecular and Chemical Engineering

E-mail: [debe@uiuc.edu](mailto:debe@uiuc.edu)

Web address [http://www.las.uiuc.edu/studetns/programs/CH E/\\*\\*\\*\\*\\*](http://www.las.uiuc.edu/studetns/programs/CH_E/*****)

Degree title: Bachelor of Science in Biomolecular and Chemical Engineering

### First year

#### HOURS FIRST SEMESTER

|    |   |
|----|---|
| 3  | CHEM 107 <sup>1</sup> -Accelerated Chemistry, I   |
| 1  | CHEM 109-Accelerated Chemistry Laboratory, I      |
| 5  | MATH 120-Calculus and Analytic Geometry, I        |
| 4  | RHET 105 or 108-Composition I writing requirement |
| 3  | Elective 2,3,4                                    |
| 16 | Total   |

#### HOURS SECOND SEMESTER

|    |  |
|----|--|
| 1  | CH E 161-The Chemical Engineering Profession                           |
| 3  | CHEM 108-Accelerated Chemistry, II                                     |
| 2  | CHEM 110-Accelerated Chemistry Laboratory, II                          |
| 3  | C S 101-Introduction to Computing for Engineering and Physical Science |
| 3  | MATH 130-Calculus and Analytic Geometry, II                            |
| 4  | PHYCS 111-General Physics (Mechanics)                                  |
| 16 | Total  |

### Second year

#### HOURS FIRST SEMESTER

|    |   |
|----|---|
| 3  | CH E 261-Introduction to Chemical Engineering         |
| 4  | CHEM 236-Fundamental Organic Chemistry, I             |
| 2  | CHEM 237-Structure and Synthesis                      |
| 3  | MATH 242-Calculus of Several Variables <sup>5</sup>   |
| 4  | PHYCS 112-General Physics (Electricity and Magnetism) |
| 16 | Total   |

#### HOURS SECOND SEMESTER

|    |  |
|----|--|
| 4  | CH E 370-Chemical Engineering Thermodynamics                           |
| 3  | BIOCH 350 <sup>6</sup> -Introductory Biochemistry                      |
| 2  | MATH 225 <sup>7</sup> -Introductory Matrix Theory                      |
| 3  | MATH 285 <sup>8</sup> -Differential Equations and Orthogonal Functions |
| 2  | PHYCS 114-General Physics (Waves and Quantum Physics)                  |
| 3  | Electives <sup>2,3,4</sup>   |
| 17 | Total  |

## Third year

### HOURS FIRST SEMESTER

|    |   |
|----|---|
| 4  | CH E 371-Fluid Mechanics and Heat Transfer                            |
| 2  | CHEM 319-Instrumental Characterization of Chemical Systems Laboratory |
| 2  | CHEM 321-Instrumental Characterization of Chemical Systems            |
| 4  | CHEM 342-Physical Chemistry, I  |
| 3  | Biomolecular Engineering <sup>9</sup>                                 |
| 15 | Total   |

### HOURS SECOND SEMESTER

|    |   |
|----|---|
| 4  | CH E 373-Mass Transfer Operations                   |
| 4  | CHEM 344-Physical Chemistry, II                     |
| 3  | CH E 381-Chemical Rate Processes and Reactor Design |
| 6  | Biomolecular Engineering <sup>9</sup>               |
| 17 | Total   |

## Fourth year

### HOURS FIRST SEMESTER

|    |  |
|----|--|
| 4  | CH E 374-Chemical Engineering Laboratory       |
| 4  | CH E 389-Chemical Process Control and Dynamics |
| 9  | Electives <sup>2,3,4</sup>                     |
| 17 | Total  |

### HOURS SECOND SEMESTER

|    |   |
|----|---|
| 4  | CH E 377-Synthesis and Design of Chemical Systems |
| 11 | Electives <sup>2,3,4</sup>                        |
| 15 | Total   |

1. Students who do not place into CHEM 107, or who do not satisfy the mathematics prerequisite for CHEM 107, may substitute the sequence CHEM 101, 102, 105, 106, 223, and 224 for CHEM 107, 108, 109, and 110.
2. All Campus General Education requirements must be satisfied, including those in approved course work in the Humanities/Arts, Social/Behavioral Sciences, and Cultural Studies, including the Western, Non-Western and/or U.S. Minorities components. The requirements for the Campus General Education categories Natural Sciences/Technology, Quantitative Reasoning I, and Composition I and II are fulfilled through required course work in the curriculum.
3. Three semesters of college credit in one foreign language is required. Three years of high school credit in one foreign language are equivalent to three semesters of college credit.
4. Students must take at least 10 hours of technical electives in areas of engineering science. Distribution requirements for these 10 hours are:
  - a) At least 6 hours must be from the list of Bio-technical Electives.
  - b) At least 3 hours must be in 300-level courses chemical engineering (i.e., not in CH E 292).

Students may obtain a current list of courses that may be used to satisfy this requirement in Room 209 RAL.

5. MATH 243 (4 hours) may be substituted for MATH 242 (3 hours). The additional credit hour earned for MATH 243 will be counted as a technical elective hour.
6. BIOCH 352/353 sequence may be substituted for BIOCH 350.
7. Students may substitute MATH 315 for MATH 225. Students electing to do so should be certain that they have the prerequisites for MATH 315.
8. MATH 341 may be substituted for MATH 285. MATH 286 (4 hours) may be substituted for MATH 285. The additional credit hour earned for MATH 286 will be counted as a technical elective hour.
9. Students must take at least 3 courses from among CH E 365, 376, 385, and 385.

## Major in Specialized Curriculum in Chemical Engineering

E-mail: [debe@uiuc.edu](mailto:debe@uiuc.edu)

Web address: [http://www.las.uiuc.edu/students/programs/ch\\_e/p\\_CH\\_E.shtml](http://www.las.uiuc.edu/students/programs/ch_e/p_CH_E.shtml)

Degree title: Bachelor of Science in Chemical Engineering

### First year

#### HOURS FIRST SEMESTER

|    |   |
|----|---|
| 3  | CHEM 107 <sup>1</sup> -Accelerated Chemistry, I   |
| 1  | CHEM 109-Accelerated Chemistry Laboratory, I      |
| 5  | MATH 120-Calculus and Analytic Geometry, I        |
| 4  | RHET 105 or 108-Composition I writing requirement |
| 3  | Elective 2,3,4                                    |
| 16 | Total   |

#### HOURS SECOND SEMESTER

|    |  |
|----|--|
| 1  | CH E 161-The Chemical Engineering Profession                           |
| 3  | CHEM 108-Accelerated Chemistry, II                                     |
| 2  | CHEM 110-Accelerated Chemistry Laboratory, II                          |
| 3  | C S 101-Introduction to Computing for Engineering and Physical Science |
| 3  | MATH 130-Calculus and Analytic Geometry, II                            |
| 4  | PHYCS 111-General Physics (Mechanics)                                  |
| 16 | Total  |

### Second year

#### HOURS FIRST SEMESTER

|   |   |
|---|---|
| 3 | CH E 261-Introduction to Chemical Engineering         |
| 4 | CHEM 236-Fundamental Organic Chemistry, I             |
| 2 | CHEM 237-Structure and Synthesis                      |
| 3 | MATH 242-Calculus of Several Variables <sup>5</sup>   |
| 4 | PHYCS 112-General Physics (Electricity and Magnetism) |



16 Total

**HOURS SECOND SEMESTER**

4 CH E 370-Chemical Engineering Thermodynamics  
3 CHEM 336<sup>6</sup>-Fundamental Organic Chemistry, II  
2 MATH 225<sup>7</sup>-Introductory Matrix Theory  
3 MATH 285<sup>8</sup>-Differential Equations and Orthogonal  
Functions  
2 PHYCS 114-General Physics (Waves and Quantum Physics)  
3 Electives<sup>2,3,4</sup>  
17 Total

### Third year

**HOURS FIRST SEMESTER**

4 CH E 371-Fluid Mechanics and Heat Transfer  
2 CHEM 319-Instrumental Characterization of Chemical  
Systems Laboratory  
2 CHEM 321-Instrumental Characterization of Chemical  
Systems  
4 CHEM 342-Physical Chemistry, I  
3 Electives<sup>2,3,4</sup>  
16 Total

**HOURS SECOND SEMESTER**

4 CH E 373-Mass Transfer Operations  
4 CHEM 344-Physical Chemistry, II  
3 CH E 381-Chemical Rate Processes and Reactor Design  
6 Electives<sup>2,3,4</sup>  
17 Total

### Fourth year

**HOURS FIRST SEMESTER**

4 CH E 374-Chemical Engineering Laboratory  
4 CH E 389-Chemical Process Control and Dynamics  
9 Electives<sup>2,3,4</sup>  
17 Total

**HOURS SECOND SEMESTER**

4 CH E 377-Synthesis and Design of Chemical Systems  
11 Electives<sup>2,3,4</sup>  
16 Total

Students who do not place into CHEM 107, or who do not satisfy the mathematics prerequisite for CHEM 107, may substitute the sequence CHEM 101, 102, 105, 106, 223, and 224 for CHEM 107, 108, 109, and 110.

2. All Campus General Education requirements must be satisfied, including those in approved course work in the Humanities/Arts, Social/Behavioral Sciences, and Cultural Studies, including the Western, Non-Western and/or U.S. Minorities components. The requirements for the Campus General

Education categories Natural Sciences/Technology, Quantitative Reasoning I, and Composition I and II are fulfilled through required course work in the curriculum.

3. Three semesters of college credit in one foreign language is required. Three years of high school credit in one foreign language are equivalent to three semesters of college credit.
4. Students must take at least 19 hours of technical electives in areas of engineering science. Distribution requirements for these 19 hours are:
  - a) At least 9 hours must be in 300-level courses (or CH E 292).
  - b) At least 6 hours must be in Chemical Engineering (300-level courses and CH E 292).
  - c) At least 3 hours must be in 300-level courses chemical engineering (i.e., not in CH E 292).

Students may obtain a current list of courses that may be used to satisfy this requirement in Room 209 RAL.

5. MATH 243 (4 hours) may be substituted for MATH 242 (3 hours). The additional credit hour earned for MATH 243 will be counted as a technical elective hour.
6. BIOCH 350 may be substituted for CHEM 336.
7. Students may substitute MATH 315 for MATH 225. Students electing to do so should be certain that they have the prerequisites for MATH 315.
8. MATH 341 may be substituted for MATH 285. MATH 286 (4 hours) may be substituted for MATH 285. The additional credit hour earned for MATH 286 will be counted as a technical elective hour.

**EFFECTIVE DATE:**

Proposed: August 21, 2003