

Curriculum Improvement: **1) *Biology in the Curriculum:***

Review of the past several years of the placement of our students through the Engineering Career Services (Assessment Tool 16) has indicated that an increasing numbers our students are being employed by the food, pharma, and biotech industries (see Appendix C, slides 20 and 21, from the CBE Advisory Board presentation, 3-31-2004). Analysis of employment data indicated that the “conventional” industries of petroleum and chemicals hired less than 1/3 of our graduates in two recent years, and the biologically-based fields of food and pharmaceuticals hired approximately 1/3 of our graduates in the same sample. The latest CBE Advisory Board report (Assessment Tool 7) presented in Appendix C has also indicated the desire from the undergraduates, undoubtedly motivated by the changing employment landscape, to enhance our biological courses offerings. The input from the national debates within the chemical engineering field has also indicated the need and movement towards an increasingly integrated biological component to the curriculum to meet these changing needs. As part of this ongoing process, faculty members (Abbott, Lightfoot (speaker), Palecek, Rawlings) have also attended several NSF-sponsored Curriculum Development Workshops on the Integration of Chemical & Biological Engineering (latest held on 16 and 17 April 2004 at Tufts University, Medford MA). A summary of the second workshop is available at http://web.mit.edu/che-curriculum/2003/cape_cod/proceedings_3_session_3.pdf. Faculty members attending these workshops have reported back to the Faculty Meetings as documented in minutes for April 11 and May 2, 2003, among other instances in Appendix A. We are using such peer-based best practices and innovations as part of our curriculum development in this area.

Additionally, current faculty research interests and excitement among industrial contacts about new frontiers in chemical engineering in biology-related topics has led many academic departments to increase the biology content of their engineering programs. Given the increasingly important research component within CBE, the need for some preparation in biology was desired for many of the students embarking on a graduate school career. The change in our department name (but not the degree name) to “Chemical and Biological Engineering” was recognition of these trends within and outside of the UW-Madison environment.

Given the continued, multiple inputs, based within our assessment tool structure (documented in Appendix H), the CBE department decided that there was a need and

opportunity to improve the Chemical Engineering curriculum through the inclusion of new core courses providing scientific literacy in the biological sciences. We determined that there was a need to alter our core curriculum through the addition of a biology core requirement in place of existing chemistry and laboratory courses. An appointed committee of several biology-oriented faculty members, initially consisting of Profs. Abbott, Murphy, Palacek, Shusta, and Yin, met to identify key biology concepts useful for chemical engineering undergraduates, assess the opportunities for our curriculum and make recommendations on courses which would provide appropriate core biological background. We engaged in extensive discussions and held meetings with undergraduates and faculty. Several observations were realized. First, monitoring of the student choices for the Advanced Chemistry Elective revealed that half of our students selected Biochem 501 over the lengthy list of alternatives, indicating the dominant student perception that a biochemistry course was essential to their CBE education. Based on a variety of inputs and with consideration of the use of these new core materials within the remainder of the CBE undergraduate curriculum, the committee recommended Biochem 501 – Introduction to Biochemistry and Zoology 570 - Cellular Biology as new required undergraduate courses. These are upper-level courses that would be taken in the 5th-7th semesters, and this material would allow use of more biologically-related examples in our senior courses. An alternative change that was considered but not adopted required incoming CBE freshmen take Zoology 151 – Introduction to Biology. This more basic background would allow use of simple biological concepts in chemical engineering courses earlier in the curriculum. Review of the incoming freshmen preparation indicated that many of the freshmen had high school biology courses. Zoology 151 would provide similar course content and would not provide the desired more in-depth ‘literacy’. This new core course requirement, replacing our Advanced Chemistry Elective and the Advanced Chemistry Lab Elective, was initiated with the incoming class of 2004. We are closely monitoring the performance of our students in these classes through grades and discussion with the course instructors who reside outside of the CBE department. The recent discussions with the Biochem 501 instructors have indicated that the performance of the chemical engineering students has begun dropping relative to that of the non-engineering students in these courses (see memo dated May 27, 2004 at the end of Appendix H). We are looking into the trends over several semesters to assess whether this decline is sustained and some additional remedial biological training is required for our students to fully benefit from

these courses and to provide the background we desire. We have also undertaken interviews with students in Zool 570 to obtain similar early feedback on these course changes. It will be several years before the impact of these changes would appear in our other assessment tools, such as the EBI survey and Employer or Coop feedback. This feedback delay reinforces the need for flexibility and breadth in our array of assessment tools.

In parallel to the institution of these new core requirements, we are modifying our core courses through the use of biological and biochemical examples in the core courses. The generation of useful problems at the introductory level is a time-consuming and often slow process. Instructors in our gateway courses such as CBE 250, Process Synthesis, have been developing and incorporating such examples in their course execution. Prof. Murphy, a frequent instructor of this course, has developed a new textbook (see slide 11, Appendix H) which has a higher biological content than traditional petrochemical-based texts. This text also contains a greater emphasis on environmentally-benign processing and the creation of new processes. We have been using this text during its development for several semesters in CBE 250. In order expedite the formation of useful examples and problem sets for our undergraduate classes, Prof. John Yin was supported by the department under a departmental scholar program, and given leave from teaching, during Spring of 2003 to develop additional homework problems for trial and eventual use in the department. Prof. Yin formally presented information on the course materials he had developed in the Faculty Meeting of May 16, 2003, as documented in Appendix A. In all cases, this process of course enhancement and change is being monitored and discussed. As more biology is introduced into our introductory courses, we hope to expand the incorporation of biology into our later core courses.

The significant on-going changes in the content of our courses are intimately tied to ABET criterion a) an ability to apply knowledge of mathematics, science, and engineering. Our constituents demand a high level of technical and scientific competence yet the concept of what is the essential scientific knowledge important to chemical engineers is changing. This change in curriculum is responding to those evolving inputs to our process.

Appendix H: Biology Requirement Documentation

Big 10+ 2002 ChE Chairs Meeting February 12, 2002 Agenda

| | | |
|------------|---|----------------------------------|
| 9:00 a.m. | Room is open and continental breakfast service available | |
| 10:00 a.m. | Welcome, Introduction | <u>Discussion</u> Ekerdt |
| 10:15 a.m. | Best Practices Salary administration and how to assess merit | Ekerdt |
| 11:15 a.m. | Discussion of Department statistics | Ekerdt |
| 12:00 Noon | Lunch | |
| 1:00 p.m. | Biotechnology/Bioengineering/Biomedical Engineering The impact of local institutional initiatives and how you, as a department, are responding | Ekerdt/Zukosk |
| 2:00 p.m. | Faculty Recruiting Current areas of focus and your five-year vision of numbers and areas of emphasis | Ekerdt |
| 3:00 p.m. | ABET | Ekerdt/ Rousseau/ Rawlings |
| 4:00 p.m. | Adjourn | |

A27

Department of Chemical Engineering
Minutes of the Faculty Meeting, September 27, 2002

Present: Faculty: Abbott, Dumesic, Graham, Hill, Klingenberg, Kuech, Lynn, Murphy,
Nealey, Palecek, Rawlings, Ray, Root, Shusta, Swaney, Yin;
Student: Hubbard;
Staff: Packard.

1. Announcements:

A. None.

2. A motion to approve the minutes of the September 13, 2002 meeting passed unanimously (moved by Mr. Root, seconded by Mr. Yin).

3. Old Business:

A. None.

4. New Business:

A. Mr. Abbott, Mr. Shusta and Mr. Palecek, representing the committee charged with reviewing the department name and undergraduate curriculum in light of advances in the life sciences, distributed four handouts and discussed recommendations for changes to the curriculum, including replacing an advanced chemistry elective with Biochemistry 501, Introduction to Biochemistry, and addition of Zoology 570, Cell Biology. Much of the discussion centered on what to remove from the curriculum to accommodate Zoology 570. Mr. Abbott will gather additional information on free electives and engineering electives that students have taken in recent years for further discussion at the next meeting on October 4.

5. Closed Session:

A. The following automatic consent business was presented:
Hongfei Tang; waiver of M.S. degree requirement for non-ChE student.

Submitted: _____
Roger Packard

Department of Chemical Engineering
Minutes of the Faculty Meeting, October 4, 2002

Present: Faculty: Abbott, de Pablo, Graham, Hill, Klingenberg, Kuech, Lynn, Mavrikakis,
Murphy, Nealey, Palecek, Rawlings, Root, Shusta, Yin;
Student: Hubbard;
Staff: Myhre, Packard.

1. Announcements:

A. Mr. Packard asked faculty to encourage all students who work in laboratories to attend the special seminar on hood safety on October 8.

2. A motion to approve the minutes of the September 27 2002 meeting passed unanimously (moved by Mr. Root, seconded by Mr. Yin).

3. Old Business:

A. Mr. Abbott led a discussion of ways to cut the undergraduate curriculum to accommodate the addition of six credits of biological sciences. He distributed and discussed a handout showing elective courses taken by all 2000 and 2001 B.S. graduates. It was agreed that students generally are taking substantive courses for their electives, that there is value in allowing flexibility in the curriculum, and that other areas to cut credits from the curriculum should be explored. The committee will draft a proposal to discuss at the Visiting Committee meeting on October 11, and will bring the issue back to a future faculty meeting.

4. New Business:

A. None.

5. Closed Session:

A. The following automatic consent business was presented:
Jeffrey Greeley; distributed minor.

B. Mr. Kuech was nominated to serve for one year on the College of Engineering Academic Planning Council (nominated by Ms. Murphy, seconded by Mr. Klingenberg).
Nominations were closed and Mr. Kuech was elected unanimously.

Submitted: _____

Roger Packard

Che Undergrad Biological Electives

Class of 2000

| Name | Biochemistry | Engineering | | zool | | Other | | |
|-----------------------|--------------|-------------|---------|----------|----------|-------------|-------------|--------------------------|
| Arlfin, Mas Arif | | Ch E 560 | | | | Bot 151 | | |
| Bichwal, Jason | | | | | | | | |
| Bohnert, Kurt | BioC 501 | | | | | BioSci x10 | | |
| Chadha, Vivek | | | | | | | | |
| Chen, Victor | | | | | | BioSci x10 | | |
| Christanti, Sianny | | Ch E 541 | | | | | | |
| Cielenski, Peter | BioC 501 | | | | | | | |
| Clark, Rachel | BioC 501 | | | | | Bot 151 | | |
| Di Cosola, Elizabeth | BioC 501 | | | | | | | |
| Dzioba, Christina | BioC 501 | | | | | | | |
| Gazella, Breanna | BioC 501 | | | | | | | |
| Giles, Angela | BioC 501 | | | | | BioC x11 | | |
| Gong, Wendy | BioC 501 | | | | | | | |
| Hacker, Christopher | BioC 501 | Ch E 560 | | | | BioC 651 | BioSci x10 | |
| Hasan, Taimur | | | | | | | | |
| Hasjim, Peterson | | | | | | | | |
| Haupt, Travis John | | | | | | | | |
| Healy, Jennifer | BioC 501 | Ch E 560 | | | | | | |
| Hillier, James | BioC 501 | | | zool 152 | zool 486 | BioC 511 | BioC 550 | Certificate in Biochem |
| Holloak, Robert | BioC 501 | | | | | | | |
| Imaengjan, Wichnart | BioC 501 | | | | | | | |
| Jergovic, Christopher | | | | | | Biocore 301 | Biocore 303 | Biocore 304 |
| Kane, Heather | BioC 501 | | | zool 151 | | | | |
| Johnson, Jeffrey | BioC 501 | BME 560 | BME 561 | zool 699 | | Biocore 301 | Biocore 302 | Biocore 303 & 4 & 323 |
| Johathan, Tanti | BioC 501 | | | | | | | |
| Kilkenny, Todd | BioC 501 | | | | | | | |
| Kimura, Yoshie | BioC 501 | | | | | | | |
| Knapp, Kurtis | BioC 501 | | | | | | | |
| Koch, Margaret | | Ch E 541 | | | | BioSci x10 | | |
| Kopplin, Lisa | BioC 501 | | | | | Bact 101 | | |
| Ku Chh-yuan | BioC 501 | Ch E 561 | | | | | | |
| Kuhn, Brian | BioC 501 | | | | | | | |
| Kuswandi, Yuliana | BioC 501 | | | | | | | |
| Lathrop, Benjamin | BioC 501 | | | | | | | |
| Leino, Ryan | BioC 501 | | | zool 151 | | | | |
| Leong, Meng | BioC 501 | | | | | | | |
| Lin, John | BioC 501 | | | | | | | |
| Loker, Jason | BioC 501 | | | | | | | |
| Lydia, | | | | | | | | |
| Maack, Jennifer | BioC 501 | | | | | | | |
| Mc Neely, Parren | BioC 501 | | | zool 151 | zool 611 | Bot 466 | Bot 501 | |
| Mc Millin, Casey | BioC 501 | | | | | | | |
| Mehleis, Erin | BioC 501 | | | | | | | |
| Mercer, Kenneth | | | | | | | | |
| Morrone, Louis | BioC 501 | | | | | | | |
| Neal, Meredith | BioC 501 | | | | | | | |
| Ng, Eugenie | | | | | | | | |
| Njauw, Ken | | | | | | | | |
| Nowaczyk, Kevin | | | | | | | | |
| O'Brien, John | | | | | | | | |
| Onsager, Linda | BioC 501 | | | | | | | |
| Orloff, Jason | BioC 501 | | | | | | | |
| Owen, Jonathan | BioC 501 | | | | | | | |
| Pradono, Sudlityo | | | | | | | | |
| Rahbein, Joseph | | | | | | | | |
| Rainka, Braden | BioC 501 | Ch E 541 | | | | BioSci x10 | | |
| Ries, John | | | | | | | | |
| Roszkowski, Andrew | | | | | | Bact 101 | Bact 102 | |
| Rothschild, Benjamin | | | | | | Bot 151 | | |
| Rymar, Jason | BioC 501 | Ch E 541 | | | | | | |
| Schemensky, Sara | | | | | | | | |
| Schmid, Jason | BioC 501 | | | | | | | |
| Schulz, Anthony | | | | | | | | |
| Schuster, Joseph | | | | | | | | |
| Setuwanlo, Hengky | | | | | | | | |
| Shali, Tariq | BioC 501 | | | zool 315 | zool 316 | Bact 370 | Bact 725 | 2 Majors, 1st is biochem |
| Socha, Johnathan | Bot 151 | | | | | Bot 151 | | |
| Steinbeck, Christian | | | | | | | | |
| Suhendra, Ijen | | | | | | | | |
| Sullivan, Brady | | | | | | | | |
| Ting, Dale | BioC 501 | | | | | | | |
| Turczynski, Angela | | | | | | | | |
| Tutaj, Glory | BioC 501 | Ch E 561 | | | | | | |
| Aminul | | | | | | | | |
| Ulfig, Scott | | | | | | BioSci x10 | | |
| Vogds, Weston | | | | | | | | |
| Ward, Derek | | | | zool 151 | | | | |
| Welsh, Douglass | | | | | | | | |
| Wilmot, Colin | | | | | | | | |
| Wolff, Gregory | | | | | | | | |
| Wulz, Andrea | BioC 501 | | | zool 151 | | | | |
| Yang, Charming | BioC 501 | | | | | | | |
| Yazdani, Denish | BioC 501 | | | | | | | |

The Undergrad Biological Electives

Class of 2001

| Name | Biochem | Engineering | Zool | Other | | | | | |
|--------------------------------|----------|-------------|----------|----------|---|--------------------|----------|---------------|--------------|
| Allen, Kyle | | | | | Bact 303 | Bact 304 | | | |
| Augustine, Cynthia | Bioc 501 | ChE 560 | | | Bioc 507 | | | | |
| Beckman, Katie | Bioc 507 | ChE 560 | ChE 561 | Zool 152 | Double Major in Bioc: Multiple Bioc/Biocore Courses | | Bot 151 | | |
| Belkin, Helen | Bioc 501 | | Zool 101 | Zool 102 | Bact 303, 304 | Zool 430, 431, 466 | | | |
| Bhinder, Prithpal | Bioc 501 | | Zool 101 | Zool 102 | Bot 130 | | | | |
| Bichanich, Daniel | Bioc 501 | | | | Bot 151 | | | | |
| Bond, Michael | Bioc 501 | | | | | | | | |
| Buck, Steve | | | | | | | | | |
| Burns, William | Bioc 501 | ChE 560 | | Zool 152 | Bact 303 | Bact 304 | Gen 466 | Bioc 651, 550 | |
| Chaopricha, Patrick | Bioc 501 | | | | Bot 151 | | | | |
| Cheong, Sook Yin | Bioc 501 | | Zool 101 | Zool 102 | | | | | |
| Choi, Dong soon | Bioc 501 | ChE 560 | | | | | | | |
| Christensen, Saran | Bioc 501 | | | | | | | | |
| Christian | | | | | | | | | |
| Cihlar, Timothy | Bioc 507 | ChE 560 | Zool 101 | Zool 102 | Bioc 508 | | | | |
| Cree, Elise | Bioc 501 | | Zool 151 | | | | | | |
| Cronin, Matthew | Bioc 501 | | | | Double Major in Bioc: Multiple Bioc/ Biocore Courses | | | | |
| Ehr, Jeanette | Bioc 507 | | Zool 151 | Zool 152 | Double Major in Bioc: Multiple Bioc Courses | | Gen 466 | Bact 303 | |
| Eppstein, Brian Felicia | Bioc 507 | | | | Biocore 301, 302, 303, 304, 323, 333, 508 | | | Bioc 511, 651 | |
| Finger, Danielle | | | | | | | | | |
| Frentz, Dylan | | | Zool 151 | | | | | | |
| Geiger, Anthony | Bioc 501 | | | | | | | | |
| Genske, Jason | Bioc 501 | | | | | | | | |
| Goentoro, Lea | Bioc 501 | | | | Bact 303 | Bact 304 | | | |
| Goldsworthy, Laura | Bioc 501 | | | | Double Major in Bioc: Multiple Bioc/Biocore Courses | | | | |
| Graham, Jennifer | Bioc 501 | | Zool 151 | Zool 101 | | | | | |
| Haralson, Nathan | Bioc 501 | | Zool 101 | | | | | | |
| Hines, Elizabeth | | | | | | | | | |
| Hornemann, Charles | Bioc 501 | | | | | | | | |
| Inman, Geoffrey | Bioc 501 | | Zool 151 | | | | | | |
| Jenkins, Joshua | Bioc 501 | | | | | | | | |
| Johnson, Eric | | | | | Bot 151 | | | | |
| Jones, Laura | Bioc 501 | | Zool 151 | | | | | | |
| Kalechour, Matthew | Bioc 501 | | Zool 151 | Zool 152 | Gen 466 | | | | |
| Kavan, Julie | | | | | | | | | |
| Kent, Dorane | Bioc 501 | | | | Bact 303 | Bact 304 | | | |
| Ketterhagen, William | | | | | | | | | |
| Kim, Hana | Bioc 501 | | | | | | | | |
| King-Spengler, Stephen | Bioc 501 | | | | Triple Major Bioc, Mo Bio: Multiple Bioc/mo bio courses | | Gen 466 | Bact 303 | Bot 151, 152 |
| Kleinhans, Nathan | | | | | | | | | |
| Krasleva, Zornitza | Bioc 501 | | | | Bot 151 | | | | |
| Krause, Kevin | Bioc 501 | | | | | | | | |
| Kristopeit, Adam | Bioc 501 | | | | | | | | |
| Lawnicki, Benjamin | Bioc 501 | | | | | | | | |
| Linden, Becky | Bioc 501 | | | | | | | | |
| Lippow, Shaun | | | | | | | | | |
| Lo, Ian | Bioc 501 | | | | Bot 151 | | | | |
| Lukecart, Nathan | Bioc 501 | | | | | | | | |
| Miltz, Kevin | Bioc 501 | | | | | | | | |
| Miner, Aaron | Bioc 501 | | | | | | | | |
| Morrow, Brian | | | | | | | | | |
| Mrazek, Ryan | Bioc 501 | | | | | | | | |
| Nettekoven, Tammy | Bioc 501 | | | | | | | | |
| Orchard, Lewis | | | | | Bot 151 | | | | |
| Rahardianto, Andliya Ruddy, | Bioc 501 | ChE 560 | | | | | | | |
| Rude, Matthew | Bioc 501 | ChE 560 | Zool 151 | Zool 152 | Double Major in Bioc: Multiple Bioc Coursee | | Bact 303 | Bact 304 | |
| Samayoa, Jeffrey | | | | | | | | | |
| Sandberg, Brian | | | | | Bact 303 | Bact 304 | Bot 260 | | |
| Schlough, Douglas | Bioc 501 | | | | | | | | |
| Sherman, Jonathan | Bioc 501 | | | | Double Major in Bioc: Multiple Bioc/ Biocore Courses | | | | |
| Sherok, Daniel | Bioc 501 | | | | | | | | |
| Simurdak, Michael | | | Zool 151 | | | | | | |
| Sun, Qiong Jie | Bioc 501 | ChE 560 | Zool 101 | Zool 102 | Bot 130 | | | | |
| Treman, Jeffrey | | | | | | | | | |
| Van Nelson, John | Bioc 501 | | | | Bact 303 | Bact 304 | | | |
| Weingarten, Gretchen | Bioc 501 | | | | Bact 303 | Bact 304 | | | |
| Wibowo, Andree | | | | | | | | | |
| Winardi, Andreas | Bioc 501 | | | | | | | | |
| Winata, Hasan | Bioc 501 | | | | Bact 324 | Bact 325 | | | |
| Yeo, Grace | Bioc 501 | | Zool 101 | Zool 102 | Bot 130 | | | | |

To: Faculty of Chemical Engineering

From: Committee for the Modernization of the Undergraduate Curriculum (Murphy, Klingenberg, Palecek, Shusta and Abbott)

Re: Incorporation of Mandatory Classes in the Life Sciences into the Undergraduate Curriculum

Date: October 24, 2002

Rationale: The life sciences have become enabling sciences of Chemical Engineering. Chemical Engineering is a discipline with a unique focus on “molecular transformations”, and an increasing number of these transformations are being engineered to take place in biological systems. This trend will likely continue and thus it represents a permanent change to the scope of the discipline. It is important, therefore, that our undergraduates comprehend basic concepts dealing with molecular and cellular biology.

Recommendation: The Committee for the Modernization of the Undergraduate Curriculum (CMUC) recommends that classes in molecular and cellular biology be included as required courses in the undergraduate Chemical Engineering curriculum.

CMUC recommends that Biochemistry 501 (molecular-level biology) and Zoology 570 (cellular-level biology) be incorporated into the undergraduate curriculum by

- (I) Replacing the Advanced Chemistry Elective (3 credits) with Biochemistry 501 (3 credits)
- (II) Replacing the Chemistry Lab Elective (3 credits) with Zoology 570 (3 credits)

In formulating this recommendation, CMUC considered the following factors

(I) The committee analyzed the courses taken by our 2000 and 2001 graduating class. The following significant observations were made

- Many students are already taking Biochemistry 501 as their Advanced Chemistry Elective
 - The undergraduate curriculum contains a substantial laboratory experience for the students, including Physics 201/202 (0.25 credit), Chemistry 327/329 (0.25 credits), Chemistry 344 (2 credits), Chemistry 563 (1 credit), Chemical Engineering 324 (2 credits), Chemical Engineering 470 (1 credit), and Chemical Engineering 424 (5 credits).
 - Many undergraduates are taking experimental 599's (research for undergraduates).
- (II) The committee sought the opinion of the Chemical Engineering Visiting Committee (VC) on October 11-12, 2002. The committee was comprised of faculty from MIT, University of Minnesota and Carnegie Mellon University and senior researchers from industry. The VC strongly supported the proposed introduction of Biochemistry 501 and Zoology 570 into the undergraduate curriculum.

- (III) The committee investigated the ABET requirements and concluded that the proposed changes to the curriculum were in full compliance with ABET.

CMUC has proposed a modified undergraduate curriculum (see attachment):

- The curriculum will allow students to graduate in 4 years.
- It does not prevent students from taking elective courses in areas of specialization (e.g., polymers).
- The course work load per semester does not exceed 17 units.
- Free electives credits are distributed throughout the curriculum as three credit courses.
- The timing of the core Chemical Engineering classes has not changed.
- Chemistry 562/563 (quantum mechanics) now follows the Chemical Engineering thermodynamics sequence (classical thermodynamics).

Department of Chemical Engineering

Minutes of the Faculty Meeting, October 25, 2002

Present: Faculty: Abbott, Graham, Hill, Klingenberg, Kuech, Lynn, Palecek, Rawlings, Shusta, Swaney, Yin;
Student: Cadwell;
Staff: Myhre, Packard;
Guest: R. Byron Bird.

1. Announcements:

A. Mr. Packard reported that the University Academic Planning Council has established standard starting times for 75-minute classes in order to avoid conflicts with standard 50-minute class periods. Prior approval will be required to schedule 75-minute classes at other times.

2. A motion to approve the minutes of the October 4, 2002 meeting passed unanimously (moved by Mr. Graham, seconded by Mr. Klingenberg).

3. Old Business:

A. Mr. Abbott distributed a handout briefly explaining the rationale for incorporating mandatory classes in the life sciences into the undergraduate curriculum, and outlining recommendations of the *ad hoc* Committee for the Modernization of the Undergraduate Curriculum. The specific recommendations were to replace the advanced chemistry elective (3 credits) with Biochemistry 501 (3 credits), and to replace the chemistry laboratory elective (3 credits) with Zoology 570 (3 credits). Mr. Abbott reported that the Visiting Committee expressed strong support for incorporating courses in the life sciences into the curriculum, and that these changes still allow sufficient laboratory and chemistry courses to provide good coverage of the relevant program objectives and ABET credit distribution. Mr. Abbott also distributed a sample 4-year curriculum incorporating the proposed changes. Several suggestions were made for modifications to the 4-year curriculum to balance the load among semesters and to assure a logical sequence of courses. Ms. Myhre will work with the committee to finalize the 4-year curriculum. Mr. Kuech moved to accept the recommendations, seconded by Mr. Graham. In further discussion, it was agreed that students who take the Biocore sequence could substitute these courses for the new requirement. Students who transfer into the department without Chemistry 109/329 are currently required to take Chemistry 329 to satisfy the chemistry laboratory elective and cover the analytical chemistry content not included in their general chemistry courses. It was recognized that the proposed curriculum revisions would increase the load for students who transfer campuses or switch majors, as they will no longer be able simultaneously to satisfy a chemistry laboratory elective requirement while completing the basic chemistry requirement. To get input from the full faculty, it was agreed to put the motion to a paper ballot due Wednesday, October 30. Mr. Rawlings asked the same committee to develop a proposal for renaming the department to bring to a future meeting.

4. New Business:

- A. Mr. Bird discussed his memorandum to the faculty concerning use of the Hougen Professorship funds. He emphasized that Olaf Hougen believed strongly that top departments should lead in the development of educational materials, and that the fund was intended primarily to encourage development of materials such as textbooks, research monographs, new laboratory experiments, etc. In addition to the ideas outlined in Mr. Bird's memorandum for better achieving this goal, specific areas on which future Hougen projects might focus were discussed such as: developing problems and examples in the life sciences or microelectronics for use throughout the upper level curriculum; developing examples of how to bring chemical engineering to bear on other fields; or introducing technology-enhanced education into the curriculum.
 - B. Mr. Rawlings led a discussion of the upcoming ABET interim report and how the department assesses student outcomes. It was agreed that the current practices of surveying graduating seniors and alumni, as well as letters from coop employers provide good feedback.
 - C. Mr. Rawlings solicited opinions regarding the recommendations of the Visiting Committee. It was agreed that the issue of safety is most important, and needs to be fully addressed. Particular suggestions included: implementing regular laboratory inspections; improving housekeeping; providing formal training for 599 students; regularly updating chemical hygiene plans; and incorporating more information on safety in the undergraduate curriculum. The issue of variability in timing of preliminary examinations will be explored. Mr. Rawlings will gather pertinent information for discussion at a future meeting.
5. Closed Session:
- A. The following automatic consent business was presented:
None.
 - B. Mr. Kuech will distribute a list of faculty candidates currently under consideration who are scheduled to present at the AIChE Annual Meeting.

Submitted: _____

Roger Packard

Notes from Nov. 26, noon meeting with ChE students, J. Rawlings, Dept. Name Change Committee members N. Abbott, R. Murphy, E. Shusta, and K. Myhre

I. How did you learn about the Chemical Engineering major:

Family

Math teacher in HS

Chemistry teach in HS

Parents

Counselor in HS

Soar counselors

Friends during freshman year at UW

II. Reasons for choosing ChE:

Some students commented on why they did not choose BME vs. ChE, or that they switched from BME to ChE. because BME has too many premeds, too few co-op/intern offers compared to ChE, and too much design emphasis in the curriculum.

Students were also attracted to ChE because of the breadth of job opportunities and that they can get a good job right out of school.

Another reason is that they like chemistry and math.

III. What do they hear today about the life sciences:

News media was the largest factor, probably TV more than radio or newspapers
Learned a bit about it in HS, were introduced to the genome project

IV. Other things noted:

Would like to have taken a biology or better biology course in HS

Some like biochem 501 and would like to have taken earlier

If life science is added as a requirement to the ChE degree and that gives them more options after UG degree, then agree is a good idea.

Some did not want their choices limited for coops, interns, permanent positions or grad school by doing an option.

For those who did not have a biology or good biology course in HS, they liked the idea of an introductory course in biology.

For those who took biology courses, such as the introduction to biology courses, Zoo 101 or 151, and liked them, wished they would have taken them earlier.

VI. Department Name Change Comments:

The faculty at the meeting did not explain or point out the potential pros and cons of changing the department name. We tried to sample current student's opinions at this meeting.

Some students were in favor and some opposed - some thought the name change would scare students off who were not interested in biology. Some felt a bio option with designation on the transcript/diploma would be a good idea. One said an option would not reach HS students, instead would affect only those already admitted to Engineering and either were undecided or already decided on ChE .

Minutes of meeting with COE Pre-Engineering and Che Life Science Committee

Attending:

ChE: J. Rawlings, R. Murphy, S. Palacek, E. Shusta, K. Myhre

COE: Don Woolston, Eman Zeckie, Bonnie Schmidt

Date: November 27, 2002

Staff of COE/Pre-Engineering meet with 500-600 HS visitors per year at a 3x/week group meeting with students and parents. These are students who have already decided they are looking for an engineering program while in HS. The Dept. also runs the ESTEAM program for the top GPA HS students, inviting about 150 student from Wisconsin, Minnesota and Illinois for a Saturday overview of the Engineering degree programs at UW. They do not do mailings

They see every student at Freshman SOAR or at Transfer SOAR. The highest percent of major is the undecided group at 30% for the freshmen group. Because of this they have an introductory course, either EPD 101 or 160 to better explain the different degrees.

They explained the advising process for freshmen, how they choose a department in March after attending a group advising meeting by major. AIChE students and or ChE faculty attend to help in presenting and/or answering questions. At the end of the Freshman year students must choose a major. They apply in March and are admitted in June. ChE limit is 60/semester.

Few transfer into ChE from other Engr departments. Implication is they come from Letters and Science and probably Chemistry or undecided. The top reason they select ChE is because of good jobs, top ranking of Dept. Top reason for not selecting ChE seem to be it is too difficult academically. The higher number of credits is seen as a problem by parents. J. Rawlings said ChE faculty do not want to sent the message that we purposely wish to make the curriculum more difficult.

Bonnie Schmidt said students see bio as a more direct way of helping people, for the most part they lied bio in HS. BME students like the pre-med option. Some are clearly premed, others like tissue and cellular level of bio. Of the BME students, 25% go pre-med, 25% go into business and 50% go to grad school. If you go to med school you must have biocore. For those who do coops, most are in a plant. BME's also like the idea of being able to do their grad school here.

Asked directly if adding life science name to the name of the department would be attractive to prospective students, Don, Eman and Bonnie said yes, it would be attractive.

There was a short discussion on ChE's who go into industry/manufacturing, to make an option for their type of curriculum, concerns were that it is difficult to know what employers would do with that.

Other things noted were that very few of the undecided freshmen think of ChE as an options. BME BS/MS program is seen as easier than ChE. Most ChE's liked chemistry, but may not know the difference in HS or freshmen year between ChE and chemistry. ChE dept. is the most difficult to get to ESTEAM, which happens 3 times a year.

Things ChE Dept can do:

We can send communications about name or degree changes to all Wisconsin HS Chemistry and Math teachers. Should also do this for Minnesota (in-state tuition). We currently send out our UG brochure including a letter to all Chemistry and HS Counselors to all HS in WI when it is updated. We also give copies to the Dean's offices and to Coop/Intern office.

We can be told on Feb 1 of fall 2003 class admitted with ChE as a major. It seems a good opportunity to send letters to these people as soon as we know who they are welcoming them to UW and ChE.

Have a bigger presence at ESTEAM

COE Can identify every admitted student who has ChE interest. We can send a mailing to these students about new directions in curriculum and new faculty

COE send out a mailing every other year to Wisconsin students, we could get the mailing list.

May 27, 2004

To: TFK, TWR, DJK
Re: Biochem 501
Cc: Linda Gatzke
From: RMM

This is simply an FYI. Prof. Bill Reznikoff called me early in the month expressing some concern about the preparation of CBE students for Biochem 501. The gist of the conversation was (a) that CBE students who take Biochem 501 without adequate preparation in biology were at a disadvantage relative to other students, and (b) that the difference in preparation between CBE and non-CBE students may grow as more CBE students take the course as a requirement rather than as an elective.

The graph below compares the grades of ChE/CBE students in Biochem 501 over the past 5 semesters (data collected by Linda) to the “expected” grades (provided by Prof. Reznikoff based on a typical grade distribution for all students in Biochem 501). The total number of ChE/CBE students varies between 16-22. There were 17 for Spring 2004. (I deleted students who received grades of “S’.) From the graph we see that the ChE/CBE student is less likely to get an A or AB, and more likely to get a BC or C, relative to the entire population. The most recent semester is much worse than previous semesters. The average GPA of the group of students who took Biochem 501 in Spring 2004 was 3.05, so it is not a particularly weak (or strong) group. By and large the students in Biochem 501 in Spring 04 are under the “old” curriculum, and taking the course by choice and not by requirement.

We will continue to monitor this situation as we phase in the changes to the biology requirement that were instituted officially in January 2004.

