1998-99
FACULTY SENATE
California State University, Sacramento

AGENDA
Thursday, December 10, 1998
**Foothill Suite, University Union**
3:00-5:00 p.m.

## INFORMATION

1. Tentative Fall 1998/Spring 1999 Faculty Senate Meeting Schedule:
   December 17--
   February 4
   February 11
   February 18 4:15 p.m., Faculty Merit Scholars Reception
   February 25
   March 4
   March 11
   March 18
   March 25
   April 1 Spring Recess
   April 8
   April 15
   April 22 3:00-3:30 p.m., 1999-2000 Senate Nominations; 3:30-5:00 p.m., 1998-99 Senate
   April 29
   May 6 3:00-3:30 p.m., 1999-2000 Senate Elections; 3:30-5:00 p.m., 1998-99 Senate
   May 13 3:00-4:00 p.m.; 4:00-5:30 p.m., Outstanding Teacher Award Reception
   May 20
   May 27 (Finals Week)

2. Senate Home Page (http://www.csus.edu/acse/ *or* CSUS Home Page *then* Administration and Policy *then* Faculty Senate) - Vice Chair Arthur Jensen

3. Report on CSU Academic Conference, November 18-20, Asilomar
   Chair Krabacher and Statewide Academic Senators

## CONSENT CALENDAR

FS 98-82/Ex. COMMITTEE APPOINTMENTS--University

Associate Director of Financial Aid, Selection Advisory Committee:
VIRGINIA DIXON, Faculty At-large

## REGULAR AGENDA

Carried FS 98-74/Flr. MINUTES

Approval of the Minutes of the meeting of November 5 (#7), 1998.

Carried FS 98-81/Flr. MINUTES

Approval of the Minutes of the meetings of November 12 (#8) and November 19 (#9), 1998.

FS98-86

FS 98-83/Ex. BIOMEDICAL ENGINEERING PROGRAM, REPORT OF TASK FORCE

Carried The Faculty Senate receives the report of the Biomedical Engineering Task Force (Attachment A) and recommends adoption of the Task Force Recommendations (Attachments A-1 and A-2 of the report).

Carried unan. FS 98-84/Ex. COMMENDATION--BME TASK FORCE

The Faculty Senate commends Professors Juanita Barrena, Arnold Golub, John Oldenburg, Anne-Louise Radimsky, Warren Smith, Tong Zhou, and Miki Vohryzek-Bolden, Dean Braja Das, Associate Deans Marilyn Hopkins and Paul Noble, and Associate Vice President Ric Brown for their lengthy and dedicated service on the Biomedical Engineering Task Force.

FS 98-85/CPC, GEP/GRC, Ex./Flr. GENERAL EDUCATION PROGRAM REVIEW

Carried The Faculty Senate recommends that the following procedures be adopted for conducting a review of the General Education program:

**Procedures for the Program Review of the General Education Program**

The separate formation of 1) a task force to prepare the Self Study format, and 2) a Program Review Team for the review of the General Education program.

I. **The Task Force**

A. Membership

The Task Force shall comprise members from the seven Colleges, a member from the Library faculty, a representative of Associated Students, Inc., an "academically related" faculty member, a non-voting liaison member from the Curriculum Policies Committee, and ex officio members from the General Education Policies Committee and Academic Affairs.

B. Method of Selection of Members

The Faculty Senate Executive Committee shall invite the Colleges and the Library to nominate members of the Task Force, the means of selecting nominees to be at the

discretion of the Colleges and the Library. ASI shall nominate the student representative. The Curriculum Policies Committee shall nominate its non-voting liaison member. The General Education Policies Committee shall nominate its ex-officio member. Academic Affairs shall nominate its ex-officio member, and an academically related faculty member.

In cases of more than one nominee from a unit, the Executive Committee shall choose one nominee. The Executive Committee shall submit the names of the nominees to the Faculty Senate for approval. In cases of Senate rejection of a nominee, the Executive Committee shall request an additional nominee from the concerned unit.

C. The Charge of the Task Force

The Task Force shall 1) compose the Self Study questions; 2) consulting with Institutional Studies, request the gathering of any data it believes necessary for its work and potentially useful for the Program Review Team; and 3) recommend a time table for the completion of the Review.

D. Procedures of the Task Force

The Task Force is constituted upon Faculty Senate approval of its members and its charge.

The Faculty Senate Chair shall convene the first meeting of the Task Force, which shall then elect its Chair.

The Task Force shall submit a draft of proposed Self Study questions to the General Education Policies/Graduation Requirements Committee for formal comment. Upon consideration of the Committee's response, it shall recommend Self Study questions to the Faculty Senate. Upon the approval of the Faculty Senate and the President, the Self Study format shall stand approved

II. **The Program Renew Team**

**A modification of current Blue Book policy regarding the selection and procedures of program review teams,**

A. Membership [Note: It is recommended that no more than one-half of the Review Team members be members of the Task Force.]

The Program Review Team shall comprise one faculty representative from each of the Colleges and from the Library and one student representative.

B. Method of Selection

Each College and the Library shall nominate at least two faculty members to serve on the Team. ASI shall nominate at least one student to serve on the Team.

After consultation with the GEP/GRC Committee and the Faculty Senate Executive Committee, the Provost shall select the nine members of the Program Review Team. Each of the seven Colleges and the Library shall have one member. The Provost's selections shall be subject to confirmation by the Faculty Senate. If the Senate rejects a nomination, the Provost shall submit a replacement name.

Carried **

Subject to Faculty Senate approval, the Provost shall select the Chair of the Program Review Team.

C. Charge

The charge of the Program Review Team is the current charge for Program Review Teams: to evaluate the Program and to recommend improvements in it.

D. The Self Study

The GEP/GRC Committee shall, following the approved Self Study format, prepare the Self Study. Academic Affairs and a designee of the Curriculum Policies Committee must approve the Self Study.

E. External Consultants

The Task Force shall recommend the number of external consultants to the Provost. The Provost shall, in consultation with the Program Review Team, select the consultants.

F. Program Review Team Procedures

The Program Review Team shall

- advertise the Review to the campus and provide all interested units and campus personnel an opportunity to meet with it;
- consider CSU General Education policy and General Education programs on other CSU campuses;
- collect studies and surveys relevant to General Education on campus, and with the cooperation of Institutional Studies, conduct such other studies and surveys as it considers necessary;
- consult with the External Consultants; and
- write a draft Program Review. (The Chair of the Program Review Team is responsible for the composition of the draft Review, including any minority opinions.)

The Program Review Team shall submit its draft Review to the General Education Policies Committee for formal comment. After considering those comments and making any

advisable changes in the draft, the Program Review Team shall submit its review to Academic Affairs and to the Faculty Senate.

FS 98-86/~~Ex.~~ Fir. CORNERSTONES IMPLEMENTATION PLAN, RESPONSE TO

The Faculty Senate adopts the Executive Committee's "CSUS Faculty Response to the Draft Cornerstones Implementation Plan" and forwards it to the Statewide Academic Senate for inclusion in their report to the Board of Trustees. Forward to

FS 98-87/Ex. STRATEGIC PLAN (INTERNATIONAL NATURE OF CSUS ACADEMIC PROGRAMS)

The Faculty Senate recommends that the following statement be included in the Planning Priorities of the Academic Programs theme of the CSUS Strategic Plan:

***Objective*: To strengthen and expand those aspects of the curriculum that address the international nature of modern society.**

*Rationale*. Increasingly, modern society is becoming an international one as information, peoples, cultures interact over greater and greater distances with growing disregard for traditional political and cultural boundaries. This is particularly so in the case of California, with its ethnically and nationally diverse population and its strong economic and cultural ties to other world regions. One goal of the curriculum at CSUS will be to prepare students to recognize the international aspects of their society and develop the necessary competence in dealing with the challenges it presents. A second goal recognizes that it is also important that students learn to examine critically the consequences of this increasing "internationalization" on their own society and others. Instructors will be encouraged to expand the international components of their course curricula and, where possible, students and faculty will be encouraged to expand their own international experience through travel and study abroad. It is also important that students be prepared to recognize and deal with the "international" aspects of their own society on the local, state, and national levels.

FS 98-88/APC, Ex./Fir. EXECUTIVE ORDER 665 ON STUDENT RETENTION, IMPACT OF
[Note: See Attachment B for Academic Policies Committee background.]

The Faculty Senate acknowledges the excellent work performed by the CSUS Administration ~~trying~~ to implement E.O. 665 and at the same time support the student-centered mission of the University. In addition, the Faculty Senate recommends that Institutional Studies be asked to initiate a longitudinal study to ascertain if indeed ~~passing the EPT and ELM tests~~ requiring completion of remedial coursework during their first year at CSUS enhances the performance of our students. in later yrs

FS 98-89/Fir. English Diagnostic Test

# CALIFORNIA STATE UNIVERSITY, SACRAMENTO

## DEPARTMENT OF BIOLOGICAL SCIENCES

To: Tom Krabacher
Chair, Faculty Senate

From: Juanita Barrena
Professor of Biological Sciences
BME Task Force

California State University, Sacramento
6000 J Street
Sacramento, California 95819-6036



Date: November 3, 1998

Re: Transmittal of BME Task Force Recommendations and Voting Results

I am submitting to you the Final Report and Recommendations of the BME Task Force. The enclosed Final Report and Recommendations includes a cover letter which attempts to set a context for the remainder of the Report and provide a rationale for the Committee's recommendations. The cover letter is immediately followed by a list of attachments. I call your special attention to Attachment A which sets forth ten specific recommendations for Senate action. Although I know it's a lot of paper, it is my view that all attachments other than the actual course change proposal forms (following Attachment C) and the Minutes should be forwarded to the Senate when this item is under consideration. I think it also important that minority views as expressed in the attached comments also be conveyed to the Senate.

The Final Report and Recommendations was submitted to a formal vote of the Task Force. The Final Report was also submitted to both the Administrative Council and the Academic Council of the College of Engineering and Computer Sciences with a request that they indicate their approval or disapproval of the Report and Recommendations along with any comments. All ballots and other correspondence received during the voting are enclosed in a separate document labeled "Ballot Results". Ballot results are summarized in the attached November 3, 1998, memorandum from Dean Braja Das (numbered page 2 of this transmittal).

As reported by Dean Das, the Report was approved by the BME Task Force by a vote of 8 in favor, 1 against. Associate Vice President Ric Brown, one of the members of the Task Force, attached a letter to his ballot and requested that his letter be included with the Task Force's transmittal letter. Dr. Brown's letter is included with this transmittal as page 3. Dr. Warren Smith also included a comment with his ballot. This comment is provided on page 4 of this transmittal.

The Report was also approved by a vote of the ECS Administrative Council (7 in favor, 1 against). Comments were included on two of the ballots. These comments are also included on page 4 of this transmittal letter. In his memo, Dean Das notes that the Academic Council of the School of Engineering and Computer Sciences choose to write a position paper rather than take a vote. This position paper is included with this transmittal letter as page 5.

I respectfully request that when this matter is taken up by the Executive Committee and the Senate that you extend an invitation to all members of the Task Force.

cc: Jolene Koester
BME Task Force Members

CALIFORNIA STATE UNIVERSITY, SACRAMENTO
SCHOOL OF ENGINEERING & COMPUTER SCIENCE
OFFICE OF THE DEAN

November 3, 1998

**MEMORANDUM**

TO: Professor Juanita C. Barrena
Chair, Faculty Senate BME Task Force

FROM: Braja Das
Dean, College of Engineering and Computer Science

**SUBJECT: VOTING ON BME TASK FORCE REPORT AND RECOMMENDATIONS**

Following are the vote counts on the BME Task Force Report and Recommendations.

**BME Task Force Members**

| | |
|---|---|
| Approve the motion to adopt the report | 8 |
| Do not approve the motion to adopt the report | 1 |
| Ballots not returned | 0 |

**ECS Administrative Council Members**

| | |
|---|---|
| In favor of the Task Force report | 7 |
| Against the Task Force report | 1 |
| Ballots not returned | 0 |

**ECS Academic Council Members**

Did not vote. Position paper attached.

enclosures



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CALIFORNIA STATE UNIVERSITY, SACRAMENTO

RESEARCH AND GRADUATE STUDIES
OFFICE OF THE ASSOCIATE VICE PRESIDENT

October 26, 1998

TO: BME Task Force Members
Juanita Barrena, Chair

FROM: Ric Brown
Associate Vice President
Research, Graduate and Extended Programs
Member, BME Task Force

RE: Task Force Recommendations

First, I thank the other members of the task force and chair, Dr. Juanita Barrena, for the extraordinary effort expended to present this report. I cannot remember a time when so many gave so much time (over the summer, no less) on a project such as this.

Having said that, I will vote YES regarding the report, with 3 caveats concerning recommendations # 6, 7 and 10. I would ask that my concerns accompany either the transmittal letter of the vote to the Senate, or be addended to report itself. While theses are issues I raised at the task force meeting, I reiterate them below:

#6 While the University has the ultimate responsibility to ensure that current students are allowed to finish the program, the details of that program are properly left to the department and College. In my view, a fixed schedule (attachment B), prescribed by a committee, is but one way to ensure that students complete the program. Alternatives may exist that are best prescribed by the department and College, recognizing the needs of students.

#7 Any need for resources should emanate from the department and College through the duly authorized consultative process. 'Earmarking,' instructional money for a specific program within a College and department without using the existing process is not appropriate in a shared governance model.

#10 It would be more appropriate to have Deans and faculty from the 3 colleges to come together to explore the development of a new, interdisciplinary MS. If there is a sense that such a program is viable (based on the report's proposal as a starting point), that group can determine a process for future consultation and action. Clearly, the role of faculty in academic programs is preeminent. Certainly, my office would assist in any way possible.

Thank you.

c: Koester
Krabacher



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BALLOT COMMENTS: (Note: Originals included in attached Ballot Results packet

Comments from BME Task Force Member Warren Smith

In response to the Senate's charge, the BME Task Force revised BME admission requirements, cut BME background course requirements, condensed BME core courses, cut BME electives and BME labs, and developed courses to serve students in other departments and programs as well as BME students. This revised BME Program should be given a chance, instead of being eliminated.

Comments from ECS Administrative Council Member

The BME Program should be phased out gradually. At any rate, we should wait for the new interdisciplinary program to be well established before discontinuing the current BME program.

Comments from ECS Administrative Council Member Ngo Thinh

I'd like to see the new interdisciplinary degree program to be developed and implemented within 2 years.

## ACADEMIC COUNCIL - COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

Special Meeting Minutes
Friday, October 306, 1998, 2:00 PM - Tahoe Room (UNION)

Members Present: (CE) John Johnston; (CSc) Bob Buckley-chair; (EEE) Steve deHaas, John Oldenburg; (ME) Andrew Banta, Tom Liu; (Dean's Office) Mary-Jane Lee-ex officio. Members Absent: (CE) Ed Dammel; (CSc) John Clevenger; (ME) Tom Liu.

### SUBJECT: DISCONTINUATION OF THE BME PROGRAM

The Council met to consider the Dean's request that members of the Council register their approval or disapproval regarding the recommendations made by the BME Task Force. After considerable discussion, the Council *unanimously* agreed to forward the following comments to the Task Force.

The Council notes that just a few years ago the BME program was a very high quality, nationally recognized program. It was a special and valued asset to this University. When key faculty members left the program, the University administration failed to provide funds to hire their replacements. The consequences and long-term effects of that decision are manifested in the work of the Task Force and the recommendations that we are reviewing today.

Considering the history of the program and the current growth of both the medical community and the biomedical industry in the Sacramento region, the best thing the University could do would be to invest funds in the hiring of the faculty needed to continue and further develop a high quality BME graduate program. Quality educational programs require adequate funding, and some programs, such as engineering and health sciences, require more funds than others to achieve comparable levels of quality. If the BME program is to be reconstituted as the Task Force suggests, the Council recommends that the University commit to providing adequate and guaranteed support. Without such a commitment, success is unlikely.

The Council further recommends that a reconstituted BME program, in whatever form, should be capable of full accreditation by the Accreditation Board for Engineering and Technology (ABET). Lowering academic standards and rigor will not help prospective students or the community in which they will work.

While the Council supports the Task Force recommendations, it also notes that the Task Force does not offer convincing evidence in its report that commitment to an interdisciplinary program actually exists among the Colleges. In addition, the Task Force offers no evidence that making BME an interdisciplinary program will increase enrollment. Consequently, the Council urges the University to take a broad view and pursue ALL promising strategies, including a joint program with UC Davis and the UCD Medical Center.

Finally, the Council expresses concern that the recommended hiatus in admissions will make it difficult to attract students upon the restart of a reconstituted BME program. An alternative approach might be to inform prospective students about new admissions criteria and program requirements, but continue admissions and work toward ensuring adequate opportunity for newly admitted students to complete their programs of study through affiliation agreements with UCD and / or other BME programs.

CALIFORNIA STATE UNIVERSITY, SACRAMENTO
DEPARTMENT OF BIOLOGICAL SCIENCES

To: Tom Krabacher, Chair, Faculty Senate

From: Juanita Barrena, ~~Chair~~, BME Task Force

Date: November 5, ~~1998~~

RE: BME Task Force Final Report and Recommendations

On behalf of the Biomedical Engineering (BME) Task Force, I am forwarding the Task Force's Final Report and Recommendations. As you know from your participation as an ex-officio member of the Task Force, the Task Force, first convened on March 20, 1998 in response to FS 97-38, conducted an extensive review of the Master of Science Program in Biomedical Engineering with the aim of developing a proposal for continuation of the program that would be able to address the budgetary and enrollment issues that formed the basis for the 1996 recommendation from the School of Engineering and Computer Sciences (ECS) to discontinue the program. Minutes of all Task Force Meetings are provided are included as Attachment H.

The Senate specified in its charge to the Task Force that a proposal for continuation would have to address (1) how resources sufficient to staff necessary course offerings and sustain program quality are to be generated, and (2) how the program will be able to achieve a graduate SFR comparable to that of other programs in ECS (i.e., between 8 and 10). The charge to the Task Force further specified that a proposal must also include consideration of the following:

(1) the development of courses that serve majors in other departments both in and out of the School of ECS;
(2) revision of the curriculum to include courses offered by other departments both in and out of the School of ECS;
(3) establishment of the program as an interdisciplinary program with additional faculty and resources drawn from participating schools;
(4) revision of admission criteria to be more "in-line" with BME programs at other institutions, with particular attention to the academic qualifications for admission;
(5) strategies for student recruitment;
(6) strategies for increasing grant and contract support for research and graduate assistantships.

While the Task Force approached its charge affirmatively; that is, with the aim of developing a proposal that would include all the considerations enumerated above, **the conclusion of the Task Force is that a proposal cannot be put forth at this time which addresses adequately the curricular, staffing, resource, and enrollment issues raised in prior reviews and confirmed in our own review**. This is not to say that the Task Force believes that such a proposal could not or should not be developed. Rather, it is the Task Force's view that a viable proposal could and should be developed, but that it would take at least a year- long effort that engages faculty from a variety of disciplines in new course development and re-envisioning the program as one that attracts greater numbers of students from engineering, health science, and natural science disciplines, and provides options that will prepare students for careers in some of the recently emerged fields of the biomedical sciences, including biomedical informatics and

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biotechnology, as well as continuing to prepare students for careers in biomedical engineering. In addition to taking a considerable length of time to develop such a proposal, additional time would be required for necessary review by departments and schools since it is imperative that such a proposal have interdisciplinary support and agreement to provide staffing and other resource support. That there is "interest" and support, in principle was evidenced to the Task Force by responses to a Questionnaire sent to departments in Natural Science and Mathematics (NSM), ECS, and Health and Human Services (see Attachment D for a summary of Questionnaire responses). Finally, **in the Task Force's view, the kind of proposal that would have to be developed would be much more than a program change proposal.** Even though the Task Force envisions that some of the courses offered in the BME program would be retained, with modification, and included in the core, new core courses, and formal options with specified requirements (including existing courses from the departments and new courses) should be included. Indeed, **it is the Task Force's view that such a proposal would be more like a new degree program proposal.** A suggestion for a new interdisciplinary M.S. program that indicates the general direction envisioned by the Task Force is provided in Attachment F. A suggestion for a new way of administering the program as an interdisciplinary program is provided in Attachment G.

In light of the Task Force's findings in its study of the current M.S. degree program in BME at CSUS in terms of enrollment, faculty resources, and other support requirements; its study of BME programs at other institutions (Attachment E); responses from other departments at CSUS (Attachment D); to sense of "market demand" (no formal study was conducted on this matter); and the time required to develop a program of this type and gain interdisciplinary support; the Task Force is unable to forward a proposal for continuation of the BME program that meets the specified requirements by the specified deadline. Instead, but for the same reasons, **the BME Task Force recommends that the current BME program be discontinued, and that a new Task Force be established to develop a new interdisciplinary degree program.** Attachment A presents a summary of all recommendations of the Task Force. Specifics related to implementation of program discontinuation, including cost estimates and time lines for completion of prerequisites and core requirement within two years are provided in Attachment B. **It must be understood that the Task Force's recommendation for discontinuation of the M.S. in BME does not pertain to the offering of BME courses.** On the contrary, the BME Task Force strongly supports the continuation of selected course offerings in BME, whether or not a new program is developed and approved. Attachment C includes the Task Force's recommendations for deletion, retention, and modification of BME courses and is followed by individual program change proposals.

At this juncture, I wish to note that there was considerable discussion in the Task Force regarding the University's obligation to provide the courses and resources necessary for students currently enrolled in the program to complete the program. To this end, it is imperative that each continuing student be notified and met with to develop a plan for completion of all prerequisite and core requirements within the next two years in accordance with the schedule provided in attachment B, and for taking other electives that can be applied toward the total unit requirement for the degree. Although this advisement along with proposed reductions in prerequisites (Attachment B) and course change proposals that have been proposed (Attachment C) may produce sufficient enrollments in required BME courses to "justify" their being offered, low enrollments may still occur. It is the Task Force's view that regardless of enrollment, the courses specified in the discontinuation plan in Attachment B must be offered as scheduled, and that if enrollments are low that the cost burden for the School of Engineering and Computer Sciences in offering these low enrollment courses should be ameliorated by an augmentation from Academic Affairs.

cc: Jolene Koester, Provost

# LIST OF ATTACHMENTS

ATTACHMENT A

# SUMMARY OF BME TASK FORCE RECOMMENDATIONS

ATTACHMENT A-1

# BME TASK FORCE RECOMMENDATIONS

1. The BME Task Force recommends that the Master of Science degree program in Biomedical Engineering be discontinued.

2. The BME Task Force recommends that the Fall 1998 class be the last class admitted to the current M.S. degree program in BME.

3. The BME Task Force recommends that the two-year plan for discontinuation provided in Attachment B, which requires reduction and modification of "prerequisites" for advancement and some modification of courses (Attachment C) and other program requirements, be adopted to provide the Fall '98 class and other continuing students the opportunity to complete core requirements within a two year period. (Note: For the most part, non-BME courses in the recommended two-year plan are offered each semester, and in many cases are offered in multiple sections).

4. The BME Task Force recommends that course change proposals provided in Attachment C be approved through the regular course approval process.

5. The BME Task Force recommends that each continuing student be notified by Academic Affairs of the plan for discontinuation. In addition, the Task Force recommends that Academic Affairs urge each student to meet with an academic advisor to develop an individual plan for completion of necessary prerequisites and core courses in accordance with the two-year plan for discontinuation (Attachment B).

6. The BME Task Force urges that the University make an absolute commitment to offering the minimum schedule of BME course offerings proposed in Attachment B for Fall '98, Sp. '99, Fall '99, and Spring 2000.

7. The BME Task Force recommends that in the event that enrollment in required BME courses is insufficient to "justify" their being offered, the cost burden to the College of Engineering and Computer Sciences be ameliorated by an augmentation from Academic Affairs.

8. The BME Task Force recommends that BME courses continue to be offered beyond the two-year discontinuation period subject to the same enrollment requirements as other courses offered in ECS.

9. The BME Task Force urges that every effort be made to replace the discontinued M.S. in BME in Fall 2000 with an interdisciplinary Master of Science degree program designed to attract students from engineering, health science and natural science disciplines that will prepare students for careers in some of the recently emerged fields of the biomedical sciences, including biomedical informatics and biotechnology, in addition to careers in engineering aspects of the biomedical sciences. Specifically, the Task Force recommends that the suggestions provided in Attachment F be used as a guide for future development of such a program.

10. To the end specified in recommendation #9, the BME Task Force recommends that a new Task Force be established by the Provost to work on the development of a new interdisciplinary Master of Science degree to replace the discontinued M.S. in BME. The BME Task Force recommends that new Task Force include a coordinating group, including the Associate Vice President of Research, Graduate and Extended Programs (as Chair) and the Deans or Deans' designees from the Colleges of ECS, HHS, and NSM. The BME Task Force recommends that the charge of the Coordinating group of the new Task Force be as follows:

a. The Coordinating group shall establish and coordinate the work of interdisciplinary faculty work groups which, in turn, shall be charged to: (1) examine existing courses related to the biomedical sciences as to their suitability for cross listing in the new program; (2) work on the development of the new program and interdisciplinary courses that can serve existing degree programs in the biomedical sciences; and (3) continue work on the development of an interdisciplinary Master of Science degree program (along the lines proposed in Attachment F) designed to attract students from engineering, health science and natural science disciplines that will prepare students for careers in some of the recently emerged fields of the biomedical sciences, including biomedical informatics and biotechnology, in addition to careers in engineering aspects of the biomedical sciences, (4) develop an interdisciplinary faculty governance model using the preliminary proposal included in Attachment G as a starting point for discussion.

b. The Coordinating group of the new Task Force recommended herein shall be charged to work with the faculty work group established to develop a faculty governance model and to develop a plan for funding and administration of any newly proposed program as an Interdisciplinary Program.

ATTACHMENT B

# PROGRAM DISCONTINUATION PLAN

ATTACHMENT B-1

# PROGRAM DISCONTINUATION PLAN

## PART 1: PLAN FOR ADMISSION OF NEW STUDENTS FOR FALL 1998 AND COMPLETION OF DEGREE REQUIREMENTS BY NEW AND CONTINUING STUDENTS

### New Students For Fall 1998

All new students admitted for Fall 1998 **MUST** have COMPLETED the following undergraduate courses or their equivalents:

Physics 5A and 5B or Physics 11A and 11C; Math 30 and 31, Math 45; one semester of general chemistry (Chem 1A or 6A), Engr 17.

*Unconditional Admissions*

In order to be admitted unconditionally, students admitted for Fall 1998, **MUST** also have completed ALL of the following undergraduate"background" courses:

Bio 131, CSc 25, CPE 64, Physics 11B or Engr 70, Engr 45, EEE 106, Chem 6B or equivalent; and Bio 22.

*Conditional Admissions*: Applicants who have not completed all of the following undergraduate courses shall be informed that they are conditionally admitted and **MUST** complete the courses identified by the end of the semesters identified in order to remain in the program.

**Fall 1998**: Bio 131, CSc 25 (or CSc 16)
**Sp 1999**: CPE 64, Physics 11B (for students admitted with Physics 11A and 11C) or Engr 70 (for students admitted with Physics 5A and 5B)
**Fall 1999**: Engr 45, EEE 106
**Sp 2000**: Bio 22, Chem 6B

*Required BME Course Schedule for ALL students admitted for Fall 1998:* All students admitted for Fall 1998 should be informed that they shall be **REQUIRED** to enroll in and successfully complete the following BME courses in the semesters specified or in subsequent semesters.

**Fall 1998:** 210, 260
**Sp 1999** 231, 296A*
**FALL1999** 230, 261, 500 (students may enroll in 500 in either Fall 99 or Sp 2000)
**Sp 2000** 500 (students may enroll in 500 in either Fall 99 or Sp 2000)

* Experimental offering of a new 3 unit course in Research Methods and Practice to take the place of 1 unit of 299 and 2 of the 5 units of 500 required in the current program.

**Continuing Students**

Continuing students should be advised that they will NOT be required to complete all of the courses previously specified as admission and "background" requirements, but will be held instead to the same reduced number of requirements expected of newly admitted students as follows:

Admission Requirements: Physics SA and 58 or Physics 11A and 11C; Math 30 and 31, Math 45; one semester of general chemistry (Chem lA or 6A), Engr 17.

Background Requirements: Bio 131, CSc 25 (or CScl6), CPE 64, Physics 111B or Engr 70 (Engr 30 and Engr 110 satisfy this requirement), Engr 45, EEE 106, Bio 22, and Chem 6B or equivalent (since Chem 6B is a new background requirement, continuing students shall not be required to satisfy the requirement).

Continuing students shall be informed that BME 260 has been substituted in the core for BME 280. Hence, students who have completed 280 shall not be required to complete 260. Students who have not completed 280 shall be required to take 260.

***Schedule for completion of course requirements for continuing students:*** Continuing students shall be advised that to ensure completion of their degree, the following courses must have been taken or be taken prior to completion of the semesters specified.

**Fall 1998:** Math4S, Engr 17, Rio 131,CSc25 (or CSc 16),BME 2lO,BME 260or280

**Sp 1999:** CPE 64, Physics 11B (for students admitted with Physics 11A and 11C) or Engr 70 (for students admitted with Physics 5A and 5B), BME 231, BME 296A (or BME 299, if taken previously)

**Fall 1999:** Engr 45, EEE 106, BME 230, BME 261 (or 262), 8MB 500 (students may enroll in 500 in either Fan 1999 or Sp 2000)

**Sp 2000:** Bio 22 (recommended), Chem 6B (recommended), BME 500 (students may enroll in 500 in either Fall 1999 or Sp 2000)

Non-BME electives to satisfy unit requirements for the degree may also be taken during the semesters specified or in subsequent semesters. Consistent with current policy, students may include only six units of upper division courses to satisfy the 30 unit requirement for the degree. Substitutions for currently required BME courses not offered in the two-year schedule shall be made with the approval of a BME academic advisor. Students shall be expected to complete all courses offered in the two-year schedule in order to satisfy requirements for the M.S. in BME. Exceptions shall be granted only for serious and compelling reasons, and shall require approval of a BME advisor and the Associate Vice President for Graduate Studies. Students shall be informed by Academic Affairs that failure to complete BME courses as scheduled over the next two years is likely to result in their inability to satisfy requirements for the Master of Science Degree in BME.

Part 2

Cost Analysis for the Proposed BME Program Discontinuation Plan

Assumptions: This cost analysis is based on a yearly salary of $73,056 which corresponds to a cost per wtu of $3,044

In the FTES generation, BME 500, 295, 299 have not been included. This semester they amount to 1.59. That amount should be considerably higher next year as students complete their program. See below a discussion of 500.
No undergraduate course has been included in either the generation of FTES or in the computation of the cost.

| Fall 98 | Lecture wtus | Lab wtus | Cost | Enroll | FTES |
|---|---|---|---|---|---|
| BME 210 | 3 | | $9,132 | 9 | 1.8 |
| BME 260 | 3 | | $3,431 | 12 | 2.4 |
| Total | 6 | 0 | $12,563 | | 4.2 |

| Spring 99 | Lecture wtus | Lab wtus | Cost | Enroll | FTES |
|---|---|---|---|---|---|
| BME 231 | 2 | 2 | $12,176 | 11 | 2.2 |
| BME 296A | 3 | | $9,132 | 10 | 2 |
| Total | 5 | 2 | $21,308 | | 4.2 |

Total for Academic Year $33,871

| Fall 99 | | | | | |
|---|---|---|---|---|---|
| BME 261 | 3 | | $9,132 | 10 | 2 |
| BME 230 | 2 | 2 | $12,176 | 8 | 1.6 |
| Total | 5 | 2 | $21,308 | | 3.6 |

Spring 00

Projections indicate that approximately 46 units of 500 will be taken by students currently in the pipeline. Although some may take those the bulk will take them this semester. This would generate:

| | | | | |
|---|---|---|---|---|
| Total | 0 | 0 | $0 | 3.1 |

Total for Academic Year $21,308

Average number of graduate FTES required per semester to be funded adequately to cover cost ($6041.17/FTES)

| | | | | |
|---|---|---|---|---|
| AY 1998-99 | 5.61 | for comparison purpose: | Fall 98 Grad FTES | 5.79 |
| AY 1999-00 | 3.53 | | | |

From this analysis it seems clear that the cost and funding should be close to balance.

ATTACHMENT B-3

ATTACHMENT C

# COURSE CHANGE PROPROSALS

ATTACHMENT C

## OVERVIEW OF PROPOSED COURSE CHANGES

(See attached Course Proposal forms)

1. BME 230 and 231 are revised to incorporate content of BME 280. A proposal to delete BME 280 is submitted. Bio 231 is to be offered in Sp 1999, and 230 is to be offered in Fall 1999.

2. BME 261 is revised to incorporate some of the content of 262 (which is to be deleted) and to make it more readily accessible to majors outside of BME (especially Bio, Psych, Nursing, PT, Speech Path), engineering prerequisites are removed and course emphasis is changed from a "design emphasis" to an emphasis on ergonomics and human factors as they relate to the use of technology in the work place and in the use of assistive devices. Lab is to be deleted. BME 261 is to be offered in Fall 1999.

3. BME 210 and 260 are retained to be offered in Fall 1998. BME 295, 299 and 500 are retained.

4. A new 3 unit course to be titled Research Methods and Practice is proposed. This course would combine what is currently done by 299 and the on-going BME Seminars and would also incorporate 2 of the 5 units of BME 500 currently required. The course is proposed to be offered in Sp. 1999 in lieu of 1 unit of 299 and 2 of the 5 units of 500 currently required.

5. Delete BME 120, 211, 220, 262 (some content incorporated into the revised 261), 270, 280 (some content incorporated into the new 230-231 sequence).

6. A new course to be titled Electronic Instrumentation and Measurement for Applied Science is proposed. This course replaces BME 120, and is designed to appeal to non-engineering science disciplines.

7. A new course to be titled Assistive Technology for the Disabled is proposed. This course includes substantial components in assessment, assisitve technology and rehabilitation, and is designed to appeal to allied health majors.

ATTACHMENT D

# BME TASK FORCE QUESTIONNAIRE AND SUMMARY OF RESPONSES FROM DEPARTMENTS

CALIFORNIA STATE UNIVERSITY, SACRAMENTO

SCHOOL OF ENGINEERING & COMPUTER SCIENCE
OFFICE OF THE DEAN

April 2, 1998

TO: Department Chairs, School of Engineering and Computer Science
Department Chairs, School of Natural Science and Mathematics
Department Chairs, School of Health and Human Services

FROM: Juanita Barrena
Professor and Faculty Senator
Department of Biological Sciences

**SUBJECT: Biomedical Engineering Task Force Questionnaire (Response Requested by April 20, 1998)**

At its meeting on December 18, 1997, the Faculty Senate, as part of a resolution on the continuation/discontinuation of the master of science degree program in Biomedical Engineering (BME), recommended establishment of a task force charged with the development of a proposal for the continuation of a program in BME. The members of the task force are as follows:

Juanita Barrena, Professor and Faculty Senator, Department of Biological Sciences, **Chair**
Ric Brown, Associate Vice President for Research and Graduate Studies
[Miki Vohryzek-Bolden–alternate]
Braja Das, Dean, School of Engineering and Computer Science [Mary Jane Lee–alternate]
Arnold Golub, Chair, Department of Psychology
Michael Harter, Dean, School of Health and Human Services [Marilyn Hopkins]
Paul Noble, Associate Dean, School of Natural Sciences and Mathematics
[Marion O'Leary–alternate]
John Oldenburg, Professor, Department of Electrical and Electronic Engineering (BME Program)
Anne-Louise Radimsky, Chair, Department of Computer Science
Gerald Rothman, Professor, Division of Social Work
Warren Smith, Professor, Department of Electrical and Electronic Engineering
(BME Program)
Tong Zhou, Professor, Department of Mechanical Engineering

The Task Force is charged to develop a proposal for the continuation of an MS program in BME which must address the following issues:

(1) how resources sufficient to staff necessary course offerings and sustain program quality are to be generated, and
(2) how the program will be able to achieve a graduate SFR comparable to that of other graduate programs in ECS (i.e., between 8 and 10).

In developing a proposal, the BME Task Force ***must*** also include specific consideration of the following:

(1) the development of courses that serve majors in other departments both in and out of the School of Engineering and Computer Science;
(2) revision of the curriculum to include courses offered by other departments both in and out of the School of Engineering and Computer Science;
(3) establishment of the program as an interdisciplinary/inter-school program with additional faculty and resources drawn from participating schools;
(4) revision of admission criterial to be more "in-line" with BME programs at other institutions, with particular attention to increasing the academic qualifications required for admission;
(5) strategies for student recruitment;
(6) strategies for increasing grant and contract support for research and graduate assistantships.

In order to prepare an informed report to the Senate, the members of the Task Force need your input. To this end, we request that you complete the enclosed questionnaire. I would like to emphasize that unless the Task Force is able to develop a proposal that realistically addresses the resource and FTE issues that were raised in the original recommendation from the School of Engineering and Computer Science to discontinue the BME program, it is likely that the program **will be** discontinued. Your responses to the enclosed questionnaire may very well be the determining factor in whether or not a realistic proposal can be developed.

Unfortunately, but as usual, very little time is provided for your response. The Task Force was convened for the first time on March 20, and it must submit a proposal to the Senate in the early Fall (which means that much of the work must be completed before the end of this semester). Therefore, the Task Force requests that, if possible, the questionnaire be completed and returned by April 20, 1998. The questionnaire may be returned directly **to me** (Zip 6077) or to the **Dean/ Associate Dean Task Force Member from your School**. If you are unable to meet this deadline, but would like to be able to submit a response, please let me or your Dean/Associate Dean know by the specified deadline.

Thank you for your attention to this matter.

Enclosure
cc: Task Force Members

# BME TASK FORCE QUESTIONNAIRE

1 Identify BME courses currently in the catalog which, in their present form or in a modified form, would be appropriate as a required or elective course for students in your department.

2. Identify current BME courses that faculty in your department might be able to teach or team teach.

3. Identify types of courses within the discipline area of BME that are not currently offered but, if offered, would be appropriate as required or elective courses for students in your department.

4. With regard to Item 3 above, please identify faculty in your department who would be willing to participate in developing and teaching such courses.

5. Identify non-BME courses in your department that are similar to or have some content overlap with BME courses.

6. Identify courses in your department that you think might be appropriate for the BME students to take as part of their program.

7. Identify faculty who would be willing to become "adjunct" BME faculty, who would participate in the supervision of BME graduate student research, serve as thesis committee members, and participate in governance of the unit.

_____

Name

_____

Department

| Department | BME courses for use in another major | BME courses that others would like to have developed |
|---|---|---|
| Elec. Eng | **120**<br>**220** w/ modification | Adv course in **instrumentation + data acquisition** (follow up to BME 120 at grad level w/ extensive development using labVIEW. Could be used as an elective for EEE Grad. |
| Mech. Eng | none | **Robotics, Prosthetics, heart pumps** |
| Comp. Sci | none | **health information systems, vision, Artif Intelligence** |
| Biology | **230, 231, 261, 220, 120** and **280** (if extensive engineering prerequisites were removed and/or courses were made appropriate for students without eng. background), | Current BME courses are primarily electrical. Mechanically based courses would be more suitable for students in pre-health, and grad students in anat and physiology. Examples of BME topics in this category include: **Bone growth remodeling, Musculoskeletal system analysis, Biomechanics-based courses** (i.e., analysis of human movement, strength assessment, biomechanical modeling), **Skeletal muscle mechanics, Skeletal tissue mechanics, rehabilitation, Electron Microscopy Cardiovascular pathology assessment, Neurophysiology based courses, MRI technology, MRI applications and techniques** (using UCDMC facilities?). Should have an interdisciplinary approach. Also interested in **Bioinformatics, Structure/function of Biomolecules, Bioenergetics/Metabolism.** |
| Chemistry | **120** (although students often take Physics 115 A) | perhaps **courses with an advanced biochemistry component** |
| Psychology | modified version of Psy 261 (Human Factors) | a course in **medical scanning methods (PET, MRI)** |
| Physics | none | possibly an instrumentation course |
| Nursing | **167, 231, 261, 280** (however, the prerequisites would not be met) | none identified |
| P. Therapy | They do not currently have electives within the unit limitation of their major, but the following are appropriate:<br>**167, 261, 262** | none identified |
| Speech Path | **167** | Any **course addressing the use of assistive technology**, especially for communication, but also **switch access and seating**, would be particularly useful in it involves a number of disciplines. |
| Physical Ed. | **167, 260** | **Ergonomics, rehabilitation + othopedic biomechanics** |

| Department | non-BME courses that are similar to BME or have overlap | existing non-BME courses that might be appropriate for BME students |
|---|---|---|
| Elec. Eng | **EEE 181** and **EEE 233** (these are courses in digital signal processing) | newly redesigned electronics curriculum and labs: **EEE 108/108L**: and **EEE 109, 174** (microprocessors) and **EEE 181** (DSP) |
| Mech. Eng | none | none, but in their project "course", BME students can take as part of their program |
| Comp. Sci | none | Comp Sc **174 + 176** (data base mgmt), **215** (Artif.Intelligence) |
| Biology | **Bio 131** (prereq for BME 230, 231, 261, 280) | **Bio 131** (Systemic Physio), **222** (Mol. Bio), **Bio/Psych 115** (Neuroscience), **Bio 122** (Adv. Anatomy), **299** |
| Chemistry | none | **Chem 161** (Biochem), **Chem** 142 (Physical Chemistry) |
| Psychology | **Psych 115** Neuroscience), **Psy 111** (Physiological Psych) | **Psych 115** (Neuroscience) |
| Physics | Physics 115A +B, 130, 145, 162 | Physics 115A +B, 130, 145, 162 |
| Nursing | none | **Nursing 230** (Adv. Pathophysiology) |
| P. Therapy | **PT 111** (Topics in PT), **PT 104** (therapeutic procedures). Both courses address issues related to assistive devices, assessment of orthotics and prosthetics | Possibly **Clinical Kinesiology-** (has a strong biomechanics component, but applied focus) |
| Speech Path | **SPHP 224** (Technology for Speech Language Pathology and Audiology), SPHP 218 (Motor Speech Disorders). | **SPHP 218** (Motor Speech Disorders |
| Physical Ed. | **PE 151A** (Biomechanics) | PE **151A** (Biomechanics), **152** (Exer.Phys), **158** (motor Control) |

| Department | current BME courses that non-BME faculty could teach | Faculty willing to develop or teach courses in/for BME |
|---|---|---|
| Elec. Eng | most BME courses<br>Oldenberg, Smith | Oldenberg, Smith |
| Mech. Eng | BME 280 (T. Davey) | 3-4 faculty in computer modeling, mechanical design, material +fluid dynamics |
| Comp. Sci | none | Warner, Mitchell, DuZhang, Radimsky |
| Biology | parts of 230, 231, 280<br>Motekaitis<br>Lundmark<br>Carter | Motekaitis (A+P)<br>Lundmark (A+P)<br>Ewing (Molec.) |
| Chemistry | none identified | no interest has been shown yet |
| Psychology | none identified | Golub |
| Physics | none | Newcomb, Phelps, Ndlela, Stevens (computers only) |
| Nursing | 231 + 280 (two faculty with doctorates in comparative pathology may be able to team teach) | Carolyn Von Conwenberghe<br>Kathleen Jarvis<br>(Not confirmed) |
| P. Therapy | components of 167, 261, 267 could be taught if we had sufficient faculty do so. With our limited faculty, we would not be able to do so without additional resources to bring in part-time faculty or hire additional faculty. | Not applicable |
| Speech Path | 167 | Colette Coleman<br>Barbara Hoadley |
| Physical Ed. | 166, 167, 260 | Shimada, Elfenbaum, Baldini, Willett |

| Department | Faculty willing to participate as "adjunct" BME Faculty | Additional Comments |
|---|---|---|
| Elec. Eng | S.K. Ramesh, Mahlon Heller, Cindy Desmond (have served on thesis committees). | In recent years extent has been limited to service on thesis committees. If there are other opportunities for collaboration, the Chair is sure the faculty will evaluate it and participate based on their interest and availability. |
| Mech. Eng | We will be willing to work with BME grad students in research/develop projects. | |
| Comp. Sci | none indicated | |
| Biology | Motekaitis, Lundmark, Ewing. | We believe that an interdisciplinary approach is the only way this program can remain viable. BME programs are conducted on other campuses in this manner. We suggest forming a Graduate Group, with members of the group co-teaching classes, conducting seminars, developing curriculum, etc., as well as performing the duties listed on the questionnaire.<br>Resource issues are a concern, particularly where faculty may be asked to teach a part of a course (or the whole thing). How will this be handled?<br>Has there been any discussion as to approaching UCDMC (particularly orthopedics) and asking for their participation? |
| Chemistry | none identified | |
| Psychology | LeGare (already in program) | |
| Physics | Phelps, Ndlela, Newcomb | not willing to commit, but willing to join |
| Nursing | L. Timmer (governance)<br>If requested, a number of faculty with medical-surgical background could assist with BME students as second/third readers for thesis. | The BME courses would be excellent for an Advanced Practice MS student with a rehabilitation focus. However, we do not have a consistent number. We could if the BME courses/program emphasized rehab as a graduate focus for teaching or clinical specialty. |
| P. Therapy | none available due to small numbers | |
| Speech Path | Colette Coleman,<br>Jim McCartney | |
| Physical Ed. | None | not willing to overextend faculy |

ATTACHMENT E

# OTHER BME PROGRAMS – A COMPARISON

DRAFT - 5/15/98

# Report from SubCommittee II

The subcommittee reviewed the programs of selected institutions which were considered either prominent in the field or comparable to C.S.U.S. Twelve (one is actually pending but will be included in final report) institutions were reviewed:

Arizona State
City College of New York
Drexel University
John Hopkins
Ohio State University
Penn State University
Rutgers, the State University of New Jersey
University of California, Berkeley and San Francisco
University of California, Davis (pending)
University of California San Diego
University of Pittsburg
University of Washington

A table comparing those programs characteristics to that of the C.S.U.S. program has been distributed and will be presented in its final form once updated. The areas of comparison are:

Organizational Structure
Related Degrees Offered
Admission Requirements
Semester Units Required for an M.S.degree
Specialties Provided
Number of Courses Offered
Students Admitted Per Year

Information in some of these categories is somewhat sketchy. What follows is a summary of the committee's findings:

## Organizational Structure

The terminology varies slightly. Some departments are called Biomedical Engineering, some are called Bioengineering. We have not differentiated between the two categories. Of the twelve programs reviewed most are housed within a College/School of Engineering (8). Of those 5 constitute a separate department, of those 2 are joint programs with a School of Medicine. Of the other 3, 1 is a joint program with the Graduate School and two are concentrations within departments of Chemical, Electrical, and Mechanical Engineering. Two more programs are housed in a "BME Center," one is in a "Graduate Group," and one is in a School of Biomedical Engineering, Science and Health Systems. Hence our program seems to fit the most typical pattern of housing in a School of Engineering, although it does not constitute a separate department it is not embedded as an option in more traditional degree program either.

**Related Degrees Offered**

All the programs reviewed are associated with a Ph.D. program. In addition, nine offer an undergraduate program, or at least a concentration within an undergraduate program.

**Admission Requirements**

Most program require at least the general GRE test. The TOEFL is typical. A minimum GPA of 3.0 is prevalent although several programs indicate that higher GPA are usually necessary to gain admission. Most programs don't indicate letters of reference. Most programs accept a BS or BA in Engineering, Biology or other sciences. Typically specific coursework is outlined:

Calculus to Differential Equations
Physics
Chemistry
Biology

Students are often allowed to remedy some of their deficiencies in parallel with the pursuit of their graduate degree. In this the C.S.U.S. program does not seem to deviate drastically from the norm.

**Semester Units Required for an M.S.degree**

Some programs are on a quarter system. to provide easier comparison their requirements were converted to semester units. The requirements vary from 25 to 38 (specifically 25 - 1, 30 - 2, 36 - 2, 38 -1. A thesis is typical and 6 to 9 units are allocated to that pursuit.

**Specialties Provided**

A wide range of specialties reflect the local conditions. Of all the specialties listed it appears that the one which might fit C.S.U.S. best are:

Instrumentation
Signal Processing and Modeling
Human Interface

**Number of Courses Offered**

Varies widely from 5 to 35. Often hard to determine.

**Students Admitted Per Year**

Hard to tell

**Number of Part-time Faculty**

Hard to tell.

| CATEGORY | CSUS | | |
|---|---|---|---|
| Admission Requirements | BS Degree;<br>GPA 3.0 in Science, Math & Engineering or 3.0 in last 60 units;<br>Completion of Math 30, 31, 32, Physics 11A, 11B, and 11C;<br>UG degree in physics or engineering preferred, life science acceptable | | |
| Semester Units Required for an M.S. Degree | 30 units:<br>15 units required<br>10 units electives:<br>8 BME<br>2 ME<br>2 EEE<br>5 units Thesis | | |
| Specialties | Instrumentation<br>Rehabilitation Engineering<br>Signal Processing and Modeling<br>Biomechanics and Biomaterials | | |
| Organizational Structure | Biomedical Engineering Program in School of Engineering and Computer Science | | |
| Undergraduate, Masters, Ph.D. Programs? | Masters only | | |
| Number of Courses Offered | 14 Graduate Level | | |
| Students Admitted Per Year | 10? | | |
| Number of Full-time Faculty | 2 | | |

| CATEGORY | JOHNS HOPKINS | CCNY | ARIZONA STATE |
|---|---|---|---|
| Admission Requirements | GRE General Test<br>TOEFL - 600<br>Application Fee - $50<br>Tuition - $19,750/yr.<br>Average Fellowship - $1,231/mo.<br>Required Degree - Engineering Degree preferred, but any Science degree, with appropriate make up of deficiencies in course work, is acceptable<br>G.P.A. 3.5/4.0 minimum<br>Recommendation letters | No separate BME degree is currently offered. MSE with "concentration" in Biomedical Engineering<br>G.P.A. 3.0/4.0 minimum<br>TOEFL - 550<br>GRE General Test | GRE General Test<br>TOEFL - unspecified<br>Application Fee - $35<br>Tuition - Residents pay $1,884/yr.; Non-residents pay $7,912<br>All majors accepted. The administrative committee of the department determines the amount of background course work for each admitted student. |
| Semester Units Required for an M.S. Degree | No formal course requirements. Normally take 2 years of full-time course work for Ph.D.<br>(Masters, unspecified)<br>Thesis required | Normal M.S. requirement at the institution is 30 semester units with a comprehensive examination AND a thesis or project | 30 units including 6 thesis units |
| Specialties | Vascular Bioengineering<br>Biomedical Optics<br>Polymeric Biomaterials<br>Medical Imaging<br>Physiological Mechanics<br>Human Motor Learning<br>Biomedical Instrumentation<br>Cardiac Bioelectric Systems<br>Auditory Neurophysiology<br>Computational Cardiology<br>Neural Encoding | Cellular Bioengineering<br>Materials<br>Signal Processing<br>Imaging | Biocontrols<br>Bioinstrumentation<br>Biomaterials<br>Biomechanics<br>Biosystems Engineering<br>Molecular and Cellular Engineering |
| Organizational Structure | Department of Biomedical Engineering in Schools of Engineering/Medicine | BME Concentration is administered through the Chem. E, ME, EEE departments | Administered through the Department of Chemical, Electrical and Materials Engineering |
| Undergraduate, Masters, Ph.D. Programs? | U, M, P | Concentrations in BME offered U, M, P | U, M, P |
| Number of Courses Offered | 32 Graduate level | 5 Graduate level | 10 Graduate level |
| Students Admitted Per Year | Approximately 20 Masters Candidates | No breakdown information for BME concentrations | Approximately 20 Masters Candidates |
| Number of Full-time Faculty | 30 — Program ranked #1 by U.S. News & World Report | 26 (listed as "participants" in the Program) | 9 |

| CATEGORY | UCSF/UCB | U OF WASHINGTON |
|---|---|---|
| Admission Requirements | BA/BS in Engineering, Biology or other sciences; 2 years college math including calculus & differential equations; course in linear algebra desirable; 1 year physics; 1 year chemistry; "extensive" UG work in either engineering or biology;<br>GPA 3.0 (4.0 scale)<br>3 letters of reference<br>GRE general test<br>TOEFL (if non-English speaking & have not completed 1 year of university studies in US) | UG honors program for pre-med major requires 65 quarter units of pre-engineering coursework which includes math, physics, chemistry & technical writing; GPA of 3.5;<br>Grad programs require UG degrees in engineering, biology or chemistry;<br>GRE general test score, TOEFL score of 500 (below 580 required to take an ESL diagnostic test); minimum GPA of 3.0; personal statement, letters of reference, unique talent, special situations & program balance also considered |
| Semester Units Required for an M.S. Degree | NA | 199 quarter units (132 semester) for UG degree; MS requires 45 quarter credits (30 semester); PhD requires at least 81 quarter units (54 semester) |
| Specialties | Bioengineering; bioelectronics; biotechnology; bionuclear engineering; biochemical engineering | Bioinstrumentation, biomaterials, biomechanics, controlled drug-release systems, imaging, microsensors, bioelectromagnetics, molecular bioengineering, microcirculation, cellular bioengineering, muscle, and simulation of biosystems |
| Organizational Structure | College of Engineering, Bioengineering Department | College of Engineering, Bioengineering Department |
| Undergraduate, Masters, Ph.D. Programs? | UG at UCB; PhD offered by Bioengineering Graduate Group of UCSF/UCB (MS offered along the way if desired, but not an independent option) | UG honors program for those bound for the MD/PhD program; MS in Engineering for those with UG engineering degree; MS for students with biology or chemistry background; MD/PhD program |
| Number of Courses Offered | | 9 UG courses and 33 graduate courses in catalog |
| Students Admitted Per Year | 8-10 PhD students/year; approximately 30 UG students graduate per year | 5/year to UG program; # in graduate programs unknown |
| Number of Full-time Faculty | 105 faculty associated with Bioengineering Graduate Group; about 18 faculty in UG program | 61 listed in catalog |

| CATEGORY | UC SAN DIEGO | PENN STATE | RUTGERS |
|---|---|---|---|
| Admission Requirements | BA or BS in Engineering, Biology or other sciences;<br>Adequate proficiency in math, physics, mechanics, chemistry and biology (two years of math, one year each for the others);<br>GPA 3.0<br>GRE<br>TOEFL 550 (600 preferred) | BA or BS in engineering, physics, or the life sciences;<br>6 units of chemistry<br>9 units of calculus-based physics;<br>Calculus & differential equations;<br>3.0 junior/senior GPA<br>GRE<br>24 units in engineering required before graduation | Baccalaureate<br>Differential Equations<br>Intro to Computers<br>Mechanics of Solid<br>for Option I & II<br>Linear Systems & Signals<br>Biomed Theory I & II<br>Optional<br>Intro to Bioengineering I & II<br>Intro to Biomaterials |
| Semester Units Required for an M.S. Degree | 48 quarter units<br>(18 units required - 30 units elective) | 25 units<br>(7 units in BIOE<br>6 units electives<br>6 units technology oriented<br>6 units life science) | 38 units (32 required, 6 electives) |
| Specialties | Research in:<br>Cardiac Mechanics<br>Cell Biophysics<br>Micro-circulation<br>Cartilage Tissue Engineering<br>Biosensors<br>Quantitative Microscopy<br>Radiology | Research in<br>Artificial Heart<br>Ultrasound<br>Micro-circulation<br>Cellular Biomechanics<br>Electrophysiology<br>Medical Ultrasonic Transducer | Physiological System<br>Vision, Imaging & Neuro Computing<br>Biomechanics & Biomaterials |
| Organizational Structure | Department of Bioengineering in cooperation between the School of Engineering and the School of Medicine (housed in School of Engineering) | Bio Engineering Program inter college between College of Engineering and Graduate School | Department of Biomedical Engineering |
| Undergraduate, Masters, Ph.D. Programs? | U, M, P, MD/PhD, MD/MS | M, P | M, P |
| Number of Courses Offered | 6<br>19 related in AMES Math & ECE | 15 | |
| Students Admitted Per Year | | Graduates per year - MS 9 | |
| Number of Full-time Faculty | 9<br>6 joint with Medicine | 5 | |

| CATEGORY | UNIV OF SOUTHERN CALIF | | |
|---|---|---|---|
| Admission Requirements | Hard to tell | | |
| Semester Units Required for an M.S. Degree | 28 units (18 required; 6 electives - all BME; 4 units of thesis) | | |
| Specialties | General<br>Biomedical Imaging and Telemedicine | | |
| Organizational Structure | Department of Biomedical Engineering in School of Engineering | | |
| Undergraduate, Masters, Ph.D. Programs? | U, M, P<br>MSBME | | |
| Number of Courses Offered | 9 | | |
| Students Admitted Per Year | | | |
| Number of Full-time Faculty | 9 | | |

| CATEGORY | DREXEL U. | OHIO STATE U. | U. OF PITTSBURG |
|---|---|---|---|
| Admission Requirements | GRE recommended<br>TOEFL- 550<br>4-year bachelor degree(no mention of majors)<br>G.P.A.- 3.0/4.0 | GRE required<br>3.0/4.0 GPA<br>No mention of TOEFL and majors | GRE required<br>TOEFL unspecified<br>3.0/4.0 |
| Semester Units Required for M.S. Degree | 45 quarter units<br>Core - 27; Electives - 9;<br>Thesis only;<br>2 years is normally req. | 36 quarter units courses<br>9 units research thesis<br>Oral final | BME Principles 6<br>Life Science 6<br>BME Concentration 9<br>Graduate Electives 9<br>Thesis 6<br>Total 36 |
| Specialties | Biomechanics<br>Biomaterials<br>Clinical/Rehab. Engr.<br>Human Factor Engr.<br>Neurophysiology<br>.....<br>M.S. in Biomedical Science | Sensors<br>Visual info. sys. for the blinds<br>Motion Biomechanics<br>Medical Physics<br>Laser Applications<br>Human Movement<br>Electromyography<br>Mass transport<br>Neurosciences<br>.....<br>total 40 areas | Biomaterials<br>Biomechanics<br>Bioseparation<br>Health Operations<br>Prostheses<br>Artificial Organs<br>Computer processing of Biologically derived Signals<br>Rehablitation |
| Organizational Structure | School of Biomedical Engineering, Science and Health Systems | BME Center (seems independent) | Center for Biotechnology and Engineering |
| Undergraduate, M.S., Ph.D. | U. M. P | U. M. P | U. M. P |
| Number of Courses Offered | 20 Graduate level | 4 courses in F/97<br>6 in W/98<br>9 in S/98 and 2 in Sum./98 | 35 courses |
| Students Admitted Per Year | N/A | N/A | 35 MS/Ph.D. Candidates<br>22 Undergraduate taking minor in BME |
| Number of Full-time Faculty | Core - 64<br>Adjunct - 41 | Core - 4<br>66 participating faculty | 39 |

Prepared by T. Z.
04/19/98

ATTACHMENT F

# SUGGESTIONS FOR A NEW INTERDISCIPLINARY PROGRAM

ATTACHMENT F-1

## SUGGESTIONS FOR A NEW INTERDISCIPLINARY M.S. DEGREE PROGRAM IN THE BIOMEDICAL SCIENCES (name to be determined)

### CORE COURSES (9 units minimum)

BME 210 Principles of Bioengineering Analysis (3 units)
BME 260 Professional Practice (3 units)
BME 296A Research Methods and Seminar (3 units)*

### OTHER COURSE REQUIREMENTS (9 units minimum)

A minimum of 9 units selected from one of the following groups

**Bioengineering Emphasis:**

BME 230 Engineering Applied to Bioelectric Phenomena (3 units)
EME 231 Engineering Applied to Homeostatic Transport Systems (3 units)
BME 261 may also be required in this emphasis

Additional requirements may be specified from the list provided below or others yet to be determined or newly developed. These will consist primarily of courses in Mechanical or Electrical Engineering.

**Biomedical Informatics Emphasis:**

Required courses will be specified from the list provided below or others yet to be determined or newly developed. These will consist primarily of courses in Computer Science and Life Science.

**Biotechnology Emphasis:**

Required courses will be specified from the list provided in below or others yet to be determined or newly developed. These will consists of courses primarily in Natural Sciences and Health Sciences.

### CULMINATING REQUIREMENT (3 units minimum)

BMB 500 Master's Thesis (3-5 units)

### ADDITIONAL COURSE REQUIREMENTS (0-9 UNITS)

Additional courses specified within emphases or electives selected in consultation with an advisor to total 30 units

### POSSIBLE NON-BME COURSES TO SERVE AS ELECTIVES OR REQUIREMENTS IN SPECIFIC EMPHASES

| | | | |
|---|---|---|---|
| ME: | 173, 182, 240, 241, 270, 272 | PE | 151A, 152, 158, 254, 257 |
| BIO: | 122, 123, 180, 181, 222 | NURS: | 230 |
| PSYCH: | 111, 115 | CHEM: | 133, 142, 161, 162 |
| SPHP: | 218, 224 | CSC: | 174, 176, 215 |
| PHYS: | 115A, 115B, 130, 145 | EEE: | 108/108L, 181, 174, 233, 241, 246, 247, 271, 272 |
| PT: | New Grad courses | | |

ATTACHMENT F-2

PROPOSED REVISION OF
UNDERGRADUATE "PREREQUISITE" REQUIREMENTS

| CURRENT REQUIREMENTS | PROPOSED REQUIREMENTS |
|---|---|
| *(1) For Admission:* Physics 11A, 11B, 11C; Math 30, 31, 32 | *(1) For Admission with conditional classification:* Physics 5A and 5B or Physics 11A and 11C; Math 30 and 31, Math 45; one semester of general chemistry (Chem 1A or 6A), Engr 17 |
| *(2) Required prior to advancement:*<br><br>*(a) suggested for all students*<br><br>Math 45, Bio 22 and 131; Chem 1A; CSc 16 or 25; CPE 64, Engr 17, 30, 45, 110, 115, 124, 132: EEE 117, 180, BME 120; AND either EEE 108, 109, 174 OR Engr 112, ME 118, 119, 175 and 180.<br><br>*(b) modifications for emphases*<br><br>Additional prerequisites may be specified for advancement in the different emphases. Substitutions in or deletions from the list provide in section (a) may be made in specific emphases. | *(2) Required for full classification:* To be fully classified, students must also have completed ALL of the following courses: Bio 131, CSc 25 or CSc15, CPE 64, Physics 11B or Engr 70, Engr 45, EEE 106, Chem 6B or equivalent; and Bio 22.<br><br>*Students conditionally admitted must have completed the courses specified above in accordance with the following schedule:*<br><br>**1st semester:** Bio 131, CSc 25<br>**2nd semester:** CPE 64, Physics 11B (for students admitted with Physics 11A and 11C) or Engr 70 (for students admitted with Physics 5A and 5B)<br>**3rd semester:** Engr 45, EEE 106<br>**4th semester:** Bio 22, Chem 6B |
| *(3) Total undergraduate prerequisite units:*<br><br>*EEE Track = 88*<br>*ME Track = 93* | *(3) Total undergraduate prerequisite units:*<br><br>*All emphases = 57* |

The reduction in the number of required undergraduate units attempts to "opens" the program to non-engineering undergraduates, and expedites degree completion.

ATTACHMENT G

# POSSIBLE GOVERNANCE MODEL

# POSSIBLE GOVERNANCE MODEL FOR AN INTERDISCIPLINARY M.S. DEGREE PROGRAM IN BIOMEDICAL SCIENCES

## *Advisory Board*

### Membership

The Advisory Board shall consist of a variable number of faculty members as specified in the subsection on faculty membership, one classified graduate student as specified in the subsection on student membership, and up to two community members as specified in the subsection on community membership. The Advisory Board shall be chaired by the Coordinator of the Program.

#### *Faculty Membership*

The faculty membership shall consist of tenure track faculty who teach courses that are prerequisite for admission to the Program or are included as required courses or electives in the Program, and who indicate and interest in service on the Board. In addition, faculty who have an interest in the program and who are willing to serve as members of student research projects may be invited to membership by the Curriculum and Governance Council. The regular term of faculty membership shall be three years. At the end of a three year term, the Program Coordinator shall request that faculty members (whose terms are to expire) indicate whether they wish to serve another term.

#### *Student Membership*

The Advisory Board shall include a classified graduate student in the Program selected by the Curriculum and Governance Council. The term of student membership shall be one year.

#### *Community Membership*

The Advisory Board may include up to two members from the professional community or other regional colleges and universities. Community members shall be appointed by the Curriculum and Governance Council. The term of Community Membership shall be three years.

### Charge

The Advisory Board meets at least once each semester. The functions of the Advisory Board include advising the Curriculum and Governance Committee in matters relating to:

*overall enhancement and development of the Program
*the development and conduct of interdisciplinary research and instructional projects
*the development of grant proposals
*the development and conduct of enrichment activities (e.g., seminars)
*curriculum, budget, and governance policies
*personnel policies

The Advisory Board shall be responsible for the election members to the Curriculum and Governance Council.

## *Curriculum and Governance Council*

### Membership

The Curriculum and Governance Committee consists of the following members:

*the Coordinator of the Program, who shall serve as Chair
*all tenure track faculty who teach courses in the program
*three at-large members, one each from the Colleges of NSM, HHS, and ECS, elected by and from the Advisory Board. The term of office of at-large members shall be three years.

### Charge

The functions of the Curriculum and Governance Council shall include the following:

* review and approval of course and program change proposals
* review and approval of the recommended schedule of course offerings
* development of budget requests
* development of personnel and governance policies
* development of grant proposals
* selection of student and community members of the Advisory Board
* election of a Program Coordinator

# California State University, Sacramento

SACRAMENTO, CALIFORNIA 95819-6036

*Academic Policies Committee*
http://gaia.ecs.csus.edu/~bayardj/apc/index.html

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**DATE** : November 23, 1998

**TO** : Thomas Krabacher, Chair Faculty Senate

**FROM** : Jean-Pierre R. Bayard, Academic Policies Committee Chair

**SUBJECT**: Impact of Executive Order 665 on Student Retention

On the request of one of its members, the Academic Policies Committee (APC) invited Dr. Isabelle Hernandez-Serna, Assistant Vice-President for Academic Affairs in charge of Educational Equity and Student Retention, and Dr. Roberta Ching, Director of the Learning Skills Center, for a discussion on Executive Order 665 (EO 665). The purpose of the meeting was to ascertain the impact of EO 665 on student retention and performance. EO 665 requires that first-time freshman and lower-division students who are not exempt from the EPT and ELM must complete these exams prior to enrollment. Furthermore, students who require remedial work must begin that work during their first semester of enrollment, and continue to do so until they can demonstrate competency in English and Mathematics. APC members raised the following concerns:

1) Did the University make every effort to accommodate students who did not pass these tests in remedial courses, as well as provide them ample advising and mentoring opportunities?

2) Is passing these competency tests a good indicator that students will likely be retained and perform better in their programs?

After listening to Drs Hernandez-Serna and Ching, the Committee felt that indeed the Administration has taken every step to accommodate students in need of remedial work. For the fall 1998 entering students, only 5 out of 1438 students (requiring preparatory work) did not comply, thus were dis-enrolled. In addition, college-based departmental advising, the Center for Academic Advising, the Educational Opportunity Program and the Faculty Student Mentoring Program implemented an advising program which entailed making repeated attempts (letter, telephone calls) to provide advising to students.

APC recommends that the Senate acknowledge the excellent work performed by the CSUS Administration trying to implement EO 665 and at the same time supporting the student-centered mission of the University. Secondly, the Committee recommends that Institutional Studies initiates a longitudinal study to ascertain if indeed passing the EPT and ELM tests during their first year at CSUS enhances the performance of our students. This would go a long way in dispelling the notion that EO 665 is only designed to weed-out certain groups of students.

CSU SACRAMENTO FACULTY RESPONSE TO THE
DRAFT CORNERSTONES IMPLEMENTATION PLAN

## Introduction

The following response to the draft Cornerstones Implementation Plan has been approved by the California State University Faculty Senate. It is separate from the CSU, Sacramento campus response. While the campus response represents a broad range of viewpoints on the implementation plan, this response reflects what is primarily a faculty perspective.

Many of the principles contained in the original Cornerstones document emphasize desirable goals that have broad faculty support. We as a faculty, however, have serious concerns ~~over aspects of~~ about a objections to ~~a number~~ of the initiatives in the draft implementation plan ~~that are supposed to enable the CSU achieve these goals~~. We raise the issues below with the hope that they will be addressed in future versions of the Cornerstones Implementation Plan.

## Areas of Concern

1. There is a serious problem with the ~~tone~~ focus of the draft document. A significant difference exists between the ~~tone~~ focus of the original Cornerstones document and that of the Cornerstones Implementation Plan. The Cornerstones document is written positively and endorses principles that explicitly acknowledge the importance of a liberal education and a commitment to lifelong learning. These are elements most faculty support as central to the CSU mission. In contrast, the Cornerstones Implementation Plan focuses instead on achieving narrowly-defined quantifiable goals and does not seem to recognize the broader principles set forth in the original document. While recognizing that an implementation plan is, by its very nature, supposed to focus on concrete actions and not broad philosophical issues, the disjunction between the two documents in nonetheless very disturbing.

2. The Cornerstones Implementation Plan must acknowledge as its first priority the importance of providing high quality baccalaureate education. This sets the context in which all subsequent priorities and initiatives should be placed. This priority is not acknowledged in the current draft of the plan.

3. The Cornerstones Implementation Plan places excessive emphasis on easily quantifiable outcomes assessment. It fails to acknowledge that much of what is of value in a university education is not readily reducible to such forms of assessment. The document seems to suggest that easily measurable outcomes should be emphasized as the primary basis for awarding the baccalaureate degree, ignoring the less easily measured goals of a liberal education such as the ability to think critically, a student's intellectual and ethical growth, and the preparation for lifelong learning.

4. The emphasis on outcomes assessment (A-5 in particular) seems to suggest that assessment will drive funding. This can lead to a situation where curricula are tailored to meet assessment requirements and not student needs. The draft plan also fails to acknowledge that outcomes assessment in many areas of learning, if done effectively, is both expensive and will need to involve careful re-evaluation of articulation relationships with other institutions.

5. The language in ~~initiative E~~ the implementation plan, with its use of phrases such as "remove barriers" (to transfers) and "revisit the competencies needed to begin college –level work", and the call for a reconsideration of the use of standardized tests such as the ELM and EPT for placement purposes, seems to be calling for a lowering of the standards used to determine eligibility for admission. While faculty are strongly supportive of efforts to increase access for high school students to the CSU, lowering standards to do so ultimately harms both the student and the institution.

6. The Cornerstones Implementation Plan seems to place excessive reliance on technology and distributive learning for increasing the efficiency with which the CSU carries out its mission. These new technologies need to be employed carefully and only after due consideration of their appropriateness for certain kinds of student learning. **It is important, therefore, that high priority be given to B-3, which calls for faculty control over the pedagogical approaches used in specific learning situations.**

7. The faculty have three major concerns regarding initiative G, which focuses on faculty development.

   First, the initiative needs to be given greater priority by moving it up to an earlier position on the list. Its current placement as the last initiative in the plan, coupled with the language differences in the way it is written (see the following), suggest that currently it is only of secondary importance.

   Second, an unfortunate difference in tone separates this initiative form those that precede it. While the language in the other initiatives takes on a positive tone, identifying specific goals the CSU "will" achieve, the language relating to faculty development is much weaker, speaking only about making systematic progress in areas of faculty development. The language in this initiative needs to be strengthened to bring it in line with the initiatives in other areas, and the goals need to be spelled out more clearly.

   Third, faculty must be directly involved in the decisions on what is needed to promote faculty development and how it is to be implemented. This is particularly important in the case of those items specified in G-1: provision of a fair and reasonable reward system, the expansion of faculty roles, and a redefinition of scholarship. Faculty

needs to be extensively involved in any decision-making in these areas. The current draft does not acknowledge the need for this involvement.

8. The Cornerstones Implementation Plan fails to give sufficient attention to the issue of resources. Without sufficient resources, the major changes, innovations, and expansion in the way CSU carried out its mission simply will not come about. The implementation must address the resource issue more directly. ++

9. The plan fails to acknowledge that innovation requires the opportunity to experiment and take risks without penalty for failure. In the CSU, there currently exist disincentives that act as major barriers to experimentation and innovation in the way courses and programs are offered. Given the magnitude of the changes envisioned in the Cornerstones document, it is necessary that any implementation plan not only require the allocation of necessary resources, but also call for a systematic examination of existing barriers to innovation, such as the current heavy reliance on FTES in resource allocation decisions.

10. The draft of the Cornerstones Implementation Plan presents the picture of a centralized decision-making process in which priorities are set and carried out systemwide. This, however, is not the case. The plan must recognize, as does the original Cornerstones document, that ultimately these initiatives will be implemented on the individual campus, and not the system, level. The plan must also acknowledge that each CSU campus will have different needs, priorities, and opportunities, and allow for flexibility in the way individual campuses choose to implement Cornerstones.

11. There is a surprising absence of initiatives for implementing a number of key Cornerstones principles in the current draft plan. Specifically, there is no mention of student responsibility in the education process (Cornerstones principle #30), there are no initiatives to address the issue of state financing of higher education (Cornerstones principle #8), and no mention is made of administrative responsibility. The gaps need to be addressed in any future version of the Cornerstones Implementation Plan.

# The CSUS Faculty

12/8/98

++ Elements of the plan on which there is agreement in principle should not be implemented until resources needs are addressed adequately.

**Regarding the Cornerstones Response**:

When we get to the item, amend the motion to include forwarding it to the President and the Vice- Chancellor's Office.

**Amend to add a closing statement (such as the following) after the list of items?**

The CSUS Faculty Senate strongly urges that the Board of Trustees not adopt any implementation plans for Cornerstones that fails to address the issues raised above. Any plan that fails to do so is unlikely to garner widespread support among CSU faculty and will ultimately prove unworkable.