CALIFORNIA POLYTECHNIC STATE UNIVERSITY
San Luis Obispo, California 93407
ACADEMIC SENATE

Academic Senate Agenda
Tuesday, January 9, 1990
UU 220 3:00-5:00 p.m.

I. Minutes: Approval of the November 14, 1989 Academic Senate minutes (pp. 2-3).

II. Communication(s) and Announcement(s):
A. Academic Senate Reading List (p. 5).
B. Resolution(s) approved by President Baker:
   AS-328-89/EX Resolution on Department Name Changes
C. Communication from the Academic Senate Chair on Section 504 of the Rehabilitation Act of 1973 - services to students with disabilities

III. Reports:
A. President's Office
B. Vice President for Academic Affairs' Office
C. Statewide Senators
D. Jan Pieper, Director of Personnel and Employee Relations

IV. Consent Agenda:
Curriculum Proposal for Grading in Human Development Courses Requiring Supervision-Bailey, Chair of the Curriculum Committee (p. 6).

V. Business Item(s):
A. Resolution on Prerequisites for Upper Division Courses-Bailey, Chair of the Curriculum Committee, First Reading (p. 7).
B. Curriculum Proposal for Anthropology/Geography Minor-Bailey, Chair of the Curriculum Committee, First Reading (pp. 8-9).
C. Curriculum Proposal for Liberal Studies Program-Bailey, Chair of the Curriculum Committee, First Reading (pp. 10-12).
D. Curriculum Proposal for SPC 360-Bailey, Chair of the Curriculum Committee, First Reading (p. 13).
E. Curriculum Proposal for M.S. in Structural Engineering-Bailey, Chair of the Curriculum Committee, First Reading (pp. 14-18).
F. Resolution on Department Name Change (Computer Science Department)-Camp, Chair of the Computer Science Department, First Reading (pp. 19-24).
G. Resolution on Department Name Change (EL/EE Engineering Department)-Harris, Head of the EL/EE Engineering Department, First Reading (pp. 25-28).

VI. Discussion Item(s):

VII. Adjournment:
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<td>9/20/89</td>
<td>Draft Study of Graduate Education in The California State University (CSU)</td>
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<td>11/21/89</td>
<td>Instructional Technology Commission Report, &quot;the Student, the Faculty, and the Information Age: the Power of Technology&quot; (CSU)</td>
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<tr>
<td>12/12/89</td>
<td>Section 504 of the Rehabilitation Act of 1973 - Policy for the Provision of Services for Students with Disabilities (CSU)</td>
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Memorandum

To: Kathy Ryan, Head
Psychology and Human Development

Date: November 21, 1989

File No:

Copies:

From: C.A. (Tina) Bailey, Chair
Academic Senate Curriculum Committee

Subject: Grading in Courses Requiring Supervision

We concur with the recommendation of your department faculty that the HD 130, 140 and 150 laboratory courses be letter-graded courses while those for the internship programs be graded credit/no credit. There is indeed a significant difference in the degree of direct supervision in the courses by on-campus faculty members as elaborated on in your memo of May 2, 1989. These differences, in our collective opinion, warrant the two systems of grading.

Thank you for your very detailed rationale for the grading of experiential courses. Our committee had several discussions last spring during our review of catalog materials on this subject and it has come up again this academic year. Any further input from your faculty would be appreciated.

At this point I do not know whether our recommendation will take the form of a consent agenda item for the Academic Senate or simply be passed on to Academic Affairs. In either case, thank you for your patience.
Background Statement: During the curriculum review for the 1990-92 catalog, the Academic Senate Curriculum Committee was asked to consider the renumbering of several courses from lower to upper division as well as proposals for new courses at the upper division level. The Committee found little guidance in the catalog or in CAM as to the distinguishing features of an upper division course. The current 1988-90 catalog on page 390 shows the following:

- 300-399 Courses primarily for advanced undergraduate students, generally bearing no graduate degree credit.
- 400-499 Courses for advanced undergraduates and graduate students.

In attempting to evaluate course proposals, the Committee thought it desirable to have some objective standard for upper division status. This would help not only the Curriculum Committee but also individual departments and schools in the design of courses and course descriptions. In addition, some objective standards in the form of prerequisites to upper division courses could help students in their preparation for more advanced study.

RESOLUTION ON PREREQUISITES FOR UPPER DIVISION COURSES

WHEREAS, Neither the university catalog nor the Campus Administrative Manual have objective standards for the designation of a course as upper division; and

WHEREAS, Enrollment in an upper division course presumes that undergraduates are advanced in their studies, that is, that they have demonstrated proficiency in preparatory lower division courses or possess the maturity of previous university experience; and

WHEREAS, The skills needed for enrollment in upper division courses may be quite variable; and

WHEREAS, A department and school should have the maximum flexibility in the design of their courses and curricula; therefore be it

RESOLVED, That all upper division courses have a stated prerequisite and that prerequisite may be one of units accumulated (sophomore, junior, senior level), preparation in related coursework or support courses, or General Education and Breadth preparation; and be it further

RESOLVED, That these directions for prerequisites to upper division courses be placed into the appropriate 400 section of the Campus Administrative Manual.

Proposed By:
Academic Senate Curriculum Committee
date 11/2/89
(Vote 10-0-0)
Memorandum

To: Academic Senate Executive Committee

Date: November 16, 1989

File No:

Copies: Philip Bailey, Interim VP Acad Affairs
Warren DeLey, Chair, Social Sciences
Glenn Irvin, Dean, SLA
Wm. Rife, Assoc VP Acad Affairs

From: C.A. (Tina) Bailey, Chair
Academic Senate Curriculum Committee

Subject: Anthropology/Geography Minor

Please accept the attached curriculum proposal for an Anthropology/Geography minor which is being recommended by our committee. The proposal has been revised according to the suggestions made by us last year.
# ANTHROPOLOGY AND GEOGRAPHY MINOR

**School of Liberal Arts**

**Date:** November 9, 1989

**1990-92 CATALOG PROPOSALS**

*VP (Vice President Academic Affairs), AS (Academic Senate), CC (Curriculum Committee)*

- **A** = Approved
- **A** = Approved pending technical modification
- **AR** = Approved with Reservation (see Committee Comments)
- **T** = Tabled (see Committee Comments)
- **D** = Disapproved

## I. CURRICULUM

At least 15 units must be selected from upper division courses.

### Foundation Courses

- ANT 201 Cultural Anthropology (3) GEB D.4.a.
- ANT 203 Physical Anthropology (3)
- GEOG 150 Human Geography (3) GEB D.4.a.
- GEOG 250 Physical Geography (3)

### Global Courses

- ANT 202 World Prehistory (3)
- ANT 325 Material Culture (3)
- ANT 341 Comparative Societies (3)
- GEOG 305 Political Geography (3)
- GEOG 308 Global Geography (3) GEB D.4.b
- GEOG 315 Resource Utilization (3)

### Ecological Courses

- ANT 360 Human Cultural Adaptations (3) GEB D.4.b
- GEOG 215 Human Impact on the Earth (3)
- GEOG 250 Geography of Hunger (3)
- GEOG 325 Climate and Humanity (3)
- BIO 415 Biogeography (3)
- AM 307 World Agricultural Resources (3)

### Area Courses

- ANT 450 Area Studies (3)
- GEOG 340 California Geography (3)
- GEOG 350 Geography of the USA (3)
- GEOG 401 Area Geography (3)
- SOC 350 Sociology of Japan (3)

### Special Skills

- ANT 310, ANT 333, ANT 401, ANT 420 (new), ANT 444 (new), GEOG 310, MSC 211, AE 345, AE 445, HUM 302

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## II. COMMITTEE COMMENTS

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Memorandum

To: Academic Senate Executive Committee

Date: November 3, 1989

File No: 

Copies: Harry Busselen, Dean, Prof Studies
         Marge Glaser, Liberal Studies Program
         William Rife, Ass. V.P. Acad Affairs
         Malcolm Wilson, V.P. Acad. Affairs

From: C.A. (Tina) Bailey, Chair
       Academic Senate Curriculum Committee

Subject: Liberal Studies Program

Please add to your next agenda our committee recommendation on the Liberal Studies program (attached). The Curriculum Committee recommends approval of the entire revised program with one exception. The question of resources is one inextricably entangled in the consideration of a two course sequence of Seminar and Senior Project. The Liberal Studies committee proposed the two courses and, in theory, everyone believes this is an ideal design especially for this major. However, the resources, both monetary and in terms of personnel, make this infeasible at this time. We agree with the recommendation of Dean Busselen that the interim solution to this curriculum and resource problem lies in having a 6-unit Senior Project which would generate the resources needed for eventually offering both Seminar and Project (3 units each).

It should be mentioned that several problems exist in the administrative structure of the Liberal Studies program and in the design of the Teacher Credentialing curriculum. The issues need to be addressed by a broad representation of the university community and administration and a more satisfactory resolution must be sought than is present in the current Liberal Studies program. The Academic Senate Curriculum Committee would like to take part in such discussions.
LIBERAL STUDIES  
School of Professional Studies and Education  

Date: November 3, 1989  

1990-92 CATALOG PROPOSALS  

VP (Vice President Academic Affairs), AS (Academic Senate), CC (Curriculum Committee)  

A = Approved, A* = Approved pending technical modification,  
AR = Approved with Reservation (see Committee Comments),  
T = Tabled (see Committee Comments), D = Disapproved  

I. DEGREE PROGRAM PROPOSALS  

A. Degree Program  

1. None  

B. Minors  

1. None  

C. Concentrations or Specializations  

1. None  

II. NEW COURSES  

1. LS 301 - Interdisciplinary Fieldwork (2) 2acq  

D 2. LS 460 - Senior Seminar (3) 3sem C5  

III. DELETED COURSES  

1. None  

IV. CHANGES TO EXISTING COURSES  

Number, Title, Unit Value, C/S Number, Description and Prerequisite Changes  

AR 1. LS 101 - Act C13 to C2  

2. LS 461 (3) repeatable to (6) to (6)  

V. GENERAL EDUCATION AND BREADTH COURSES  

1. None  

VI. CURRICULUM CHANGES  

1. AD BIO 101 - General Biology (3) 1st yr  

1a. AD BIO 102 - Plant Biology (4)  

2. AD BIO 103 - Animal Biology (4)  

2a. AD BIO 105 - General Biology Lab (1) 1st yr  

3. DE BIO 127 - Natural History (3) (B.1.b) 1st yr  

4. DE MATH 118 - Precalculus Algebra (4) (B.2) 1st yr  

5. AD MATH elective (4) (B.2)  

6. DE HIST 101/HIST 102/HIST 103 - History of Western Civilization (3) 1st yr  

7. DE Courses to complete major (depending on emphasis) (5) 1st yr  

8. AD PSC 102 - The Physical Environment: Atoms and Molecules (B.1.a) (4) 2nd yr  

9. AD PSC 103 - The Physical Environment: Earth and the Universe (4) 2nd yr  

10. DE Spanish electives (4) (4) (4) 2nd yr  

11. AD Foreign language electives (4) (4) 2nd yr  

12. AD Computer literacy elective (F.1) (3) 2nd yr  

13. AD ENGL 240 - American Tradition in Literature or ENGL 330-352 (4) 2nd yr
14. DE Life or physical science elective (B.1.) (3) 2nd yr
15. AD Courses to complete major (depending on emphasis) (9) 2nd yr
16. AD MATH 327 Modern Elementary Mathematics (4) 3rd yr
17. Change ENGL 302/ENGL 392 to ENGL 390/ENGL 392/ENGL 395 3rd yr
18. AD HIST 314/HIST 339/HIST 381/HIST 415 3rd yr
19. AD PHIL 331/PHIL 335/PHIL 337 3rd yr
20. Change PE 250 to choice of BIO 220/FSN 210/HE 210/PE 250/PSY 304 3rd yr
21. DE SPN 310 Performing Literature in the Classroom (4) (Note: now a choice of 3 courses in Credential area)
22. AD SPC 316/SOC 315/SOC 316/ETHS 114/ETHS 210 (3) 3rd yr
23. DE Literature elective (300-400 level) C.3. (3) 3rd yr
24. AD PE 310 Concepts in Physical Education (3) 3rd yr
25. DE ART elective (3) 3rd yr
26. DE Fine arts elective (300-400 level) (3) 3rd yr
27. AD Restricted electives (area of emphasis) (9) 3rd yr
28. DE Social Sciences electives (6) 3rd yr
29. AD electives (3) 3rd yr
29a. AD ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) 4th yr
30. DE choice of CSC 110/CSC 111/CSC 112/CSC 118/CSC 120/CSC 410/CSC 416 (F.1) 4th yr
31. DE HIST 385 California History or GEOG 340 Geography of California (3) 4th yr
32. DE MATH/Science elective (B.1/B.2) 4th yr
33. AD Restricted electives (area of emphasis) (9) 4th yr
34. Change Courses to complete major (depending on emphasis) from 29 to 15.

Courses in Credential Emphasis (Concentration)
35. DE BIO 128, 129 Natural History (3) (3)
36. Change ED 301, ED 303, ED 401, ED 402 from required to footnote to 15 units of electives, "Students may wish to use their electives to complete the course prerequisities to student teaching: ED 301, ED 303, ED 401, ED 402."
37. DE ED 406 Teaching Language Arts and Reading in the Elementary School (4)
38. DE ED 407 Multicultural and Social Science Education in the Elem School (4)
39. Move MATH 327 Modern Elementary Applications from concentration to core curriculum
40. Change MU 301 Music for Children to MU 301/SPC 310/TH 380 (3)
41. Move PSC 102 and PSC 103 from concentration to core curriculum
42. DE PSC 303 Earth and Space Science (4)
43. AD BIO 306 Biological Applications or PSC 304 Physical Science Applications (3)
44. AD electives (15) (See item 36)

Non-Credential Emphasis (Concentration)
45. DE Fine arts/Humanities electives (6)
46. DE English/Speech electives (3)
47. DE Computer Science/Math/Science electives (15)
48. DE Social Science electives (3)
49. AD Free electives (6)
50. Change total units from (57) to (30)

VII. COMMITTEE COMMENTS
To: Academic Senate Executive Committee
Date: November 16, 1989

File No: 
Copies: Philip Bailey, Interim VP Acad Affairs
Bernard Duffy, Chair, Speech Comm
Nishan Havandjian, Head, Journalism
Glenn Irvin, Dean, SLA
William Rife, Assoc VP Acad Affairs

From: C.A. (Tina) Bailey, Chair
Academic Senate Curriculum Committee

Subject: Speech 360 Course Proposal for the 1990-92 Catalog

In its meeting of Thursday, November 9, 1989, the Academic Senate Curriculum Committee discussed the tabled Speech 360 course proposal and voted to recommend its inclusion in the course offerings of the Speech Communication department. Although we realize that there may be some overlap in the course content with that in Journalism 402, approved last spring, we feel that there is no duplication of purpose. Speech 360 is designed to emphasize rhetorical aspects of mass media communication whereas Journalism 402 emphasizes social responsibility and accountability. The rapidly expanding field of mass media communication surely has room for many diverse points of view and approaches. Please include this curriculum item as soon as possible in your agenda for the Academic Senate.
M emorandum

To: Academic Senate Executive Committee

Date: November 16, 1989

File No:

Copies: Philip Bailey, Interim VP Acad Affairs
        Day Ding, Dean, SArch/Env Design
        David Hatcher, Head, Arce
        Stephen Hockaday, Head, CE/Enve
        Peter Lee, Dean, SEng
        William Rife, Assoc VP Acad Affairs
        Mark Berrio, Arce
        H. Mallareddy, CE/Enve
        John Mouton, CM
        Cornell Pokorny, CSc

From: C.A. (Tina) Bailey, Chair
       Academic Senate Curriculum Committee

Subject: M.S. in Structural Engineering

Please place the attached curriculum for the M.S. degree in Structural Engineering on your agenda as soon as possible. As was stated in my memo of October 25, 1989 we are recommending approval of the program pending the alteration of the prefixes of Civil Engineering courses which are to be included in the program to SE. Since the October 25th note I have chaired a meeting between representatives of the Architectural Engineering and Civil Engineering departments as well as representatives from both schools involved in order to attempt to resolve the SE prefix problem. David Hatcher's memo of November 14, 1989 accurately sums up the topics of the joint meeting and his department's response to Civil Engineering's proposals. Any further discussion at this point in terms of the fine tuning required on the program should be worked out between the parties involved. It was and still is the Curriculum Committee's recommendation that the M.S. in Structural Engineering is a valid program proposal and that the compromise of each department contributing courses to the joint SE prefix was not unreasonable. It is our understanding that should the program begin and falter that those altered courses would be returned to their respective departments and that historical records such as past catalogs and this program proposal would substantiate the claims to return them.
I. DEGREE PROGRAM PROPOSALS

A. Degree Program

AR

1. M.S. Structural Engineering (joint effort of Architectural Engineering and Civil and Environmental Engineering Departments)

II. CURRICULUM

1. SE 405 Advanced Strength of Materials (3) 3lec (from CE 405)
2. SE 407 Dynamics of Structures (4) 3lec, 1lab (from CE 407)
3. SE 455 Matrix Analysis of Structures (3) 3lec (from ARCE 306 & CE 554)
4. SE 501 Advanced Structural Analysis (3) 3lec (new)
5. SE 558 Finite Element Analysis (3) 3lec (from ARCE 504 & CE 558)
6. SE 561, 562 Advanced Structural Design I, II (3) 3lab (new)
7. SE 563 Advanced Seismic Design (3) 3lab (new)
8. SE 587 Analysis and Design of Deep Foundations (3)
9. SE 590 Graduate Seminar (1) Isem
10. SE 599 Thesis (2) (2) (5) supv

Additional New Courses

1. Create new course prefix "SE" for Structural Engineering
2. SE 514 Plates and Shells (3) 3lec
3. SE 515 Inelastic Analysis and Design of Structures (3) 3lec
4. SE 518 Connection Engineering (3) 3lec
5. SE 580 Independent Study in Structural Engineering (1-3) supv

III. DELETED COURSES

1. None

IV. COMMITTEE COMMENTS

The courses (v) which are to be contributed by the ARCE and CE departments should have the SE prefix only.
Memorandum

To: Steve Hockaday, Department Chair
    Civil & Environmental Engineering Department

From: David Hatcher, Interim Department Head
    Architectural Engineering Department

Subject: M.S. PROPOSAL FOR STRUCTURAL ENGINEERING

As I agreed on November 8, I have consulted with ARCE faculty members to consider the possibility of further meetings to discuss the agenda which you presented at our meeting of November 8.

It is our opinion that such a meeting would be counter-productive and would only serve to exacerbate a deteriorating situation. We see no reason to alter the proposal which is before the Senate in the ways which you have suggested. Our reasons are as follows.

In your agenda of November 8, you stated the following objectives of the Civil and Environmental Engineering Department:

1. Successful SE Graduate Program.
2. Continued success of CE and ENVE undergraduate programs.
3. Fair and cooperative interdisciplinary activities.

With respect to item 1, we concur in this objective. But, frankly, the actions of CE/ENVE during the approval process cause us to question whether you desire a successful joint SE Graduate Program. Item 3 carries the implication that there is something unfair about the joint proposal. If that is the case, why did you and the Dean of Engineering agree to it?

The concerns which you listed in your November 8 agenda were:

1. Department faculty should drive academic programs.
2. Total quality control of CE/ENVE undergraduate programs.
3. Resources (labs, faculty, budgets) from undergraduate CE/ENVE programs should not support graduate SE program (CE resource loss is three times ARCE resource loss).
4. As there is no guarantee of success for SE program (no student or faculty allocated etc.), we need a clear path back to existing stable programs.

We concur with respect to item 1. Its inclusion here implies that CE/ENVE faculty have not properly been consulted with respect to the proposed joint program. From our perspective, there was ample opportunity for consultation during the period when the joint program was being developed. The faculty in the ARCE department were consulted and concurred with the proposal as it has been submitted. If the faculty in CE/ENVE were not consulted, that is not our concern nor should it be permitted to jeopardize the approval of the program.

Item 2 implies that the quality of the undergraduate program is in some way being compromised by the proposed joint program. If that is true, why is that issue only now being raised?

The resource issue of item 3 was addressed by the Deans in their memo to Malcolm Wilson (12/9/88) and Malcolm Wilson's response of 1/31/89. If there were problems with the management model to which Malcolm Wilson agreed, why were they not addressed by CE/ENVE to Malcolm Wilson months ago rather than being brought up at this time as a reason for obstructing approval of the proposal?

Item 4 was addressed in Bill Rife's memo of June 27, Item 4, to which we have complied. We fail to see how this continues to be a concern.

Your proposal of November 8 was as follows:

Either (a) Leave existing class prefixes in place during the trial period (cross list, separate, or in abeyance).

or (b) 1. Leave CE 407 in place (required undergrad).
2. Other classes use SE prefix.
3. Iron-clad guarantee from VPAA and Senate to go back to 88-90 catalog descriptions if SE program removed from future catalog (as suggested by Tina Bailey and Mary Whiteford).

Item (a) of your proposal has been unanimously rejected by the faculty of ARCE as being contrary to the prior agreement as embodied in the current proposal. Further, we do not agree to alternative (b) at this late date. The reason you gave for insisting on this change (and you did insist, and, furthermore, threatened that our failure to agree would result in lack of cooperation by CE/ENVE in the future even if the proposal was approved) was that CE/ENVE would lose control of a course which is required in your undergraduate curriculum. We understand your objection, but we have the same situation with respect to our ARCE 306. From our perspective, relinquishing that control is symbolic of our commitment to the joint program and
is, further, a positive step towards cooperation between the two departments at the undergraduate level. It seems to us that it promotes your objective 3 listed above. Item b3 has already been adequately addressed in the memo from Bill Rife.

I would like to comment on one item in your November 8 memo to Tina Bailey and others. You state that "Such an agreement (consisting, I presume, of our concurrence with item (b) in your November 8 agenda) would avoid the necessity to either delay or to withdraw the proposed program." This could be interpreted as a threat to further obstruct the approval of the program. We will not agree either to withdraw the proposal nor to any further delay in the presentation of the proposal to the Academic Senate. If you attempt to obstruct its approval on the floor of the Senate, one could interpret such an action as one of bad faith on the part of CE/ENVE.
RESOLUTION ON DEPARTMENT NAME CHANGE:
COMPUTER SCIENCE DEPARTMENT

RESOLVED: That the "Computer Science Department" be changed to "Computer Science and Engineering Department."

Proposed By:
Computer Science Department
January 31, 1989
Memorandum

To: Charles Andrews, Chair
   Academic Senate

From: Malcolm W. Wilson
      Vice President for Academic Affairs

Subject: PROPOSED DEPARTMENTAL NAME CHANGE FOR THE COMPUTER SCIENCE DEPARTMENT

Attached is a copy of a memorandum from the Computer Science Department dated January 24, 1989 requesting that the name of their department be changed to the "Computer Science and Engineering Department." I would appreciate the Senate reviewing this request and forwarding a recommendation to me. A response prior to the end of the Winter Quarter would be appreciated.

Attachment
Memorandum

To: Malcolm Wilson, Vice President
Academic Affairs

via

Peter Y. Lee, Dean
School of Engineering

via

Roger C. Camp, Chair
Computer Science Department

From: John B. Connely, Chair
Computer Science Dept. Curriculum Committee

Subject: REQUEST FOR DEPARTMENTAL NAME CHANGE

Pursuant to Dr. William Rife's memo of October 22, 1988, (see attachment #1), we are formally requesting that the name of the Computer Science Department be changed to the Computer Science and Engineering Department.

The desired change was initially proposed at our Fall Department Retreat. It was later discussed in some detail with Dean Lee. Finally it was unanimously approved by the Computer Science Faculty.

Dr. Lois Brady of our faculty was asked to prepare a statement encapsulating the various reasons given in support of the requested name change. Her statement is appended as attachment #2.

If this request is approved, the Department would wish to begin using the new name during the current catalog cycle.
Memorandum

To: John B. Connely
   Computer Science Department

From: Interim Associate Vice President
      for Academic Programs (x2246)

Subject: Changing the Name of the Computer Science Department

You asked me what steps you needed to take to change the name of your department to Computer Science and Engineering, besides including the change in your package of catalog revisions. I asked Malcolm Wilson.

Malcolm asks that you write a memo to him from or through Roger Camp and through Peter Lee, asking for the change; he foresees no problem in approving it. You could then use the new name before it appeared in the 1990-92 catalog.
**COMPUTER SCIENCE and ENGINEERING - why?**

**The meaning of the terms**
The American Heritage Dictionary\(^1\) gives the following definitions:

- **science**: The observation, identification, description, experimental investigation and theoretical explanation of phenomena.
- **engineering**: The application of scientific principles to practical ends as the design, construction, and operation of efficient and economical structures, equipment and systems.

Surely in this department we teach both science and engineering. Indeed it is the strong tradition of Cal Poly that we include the latter. Thus it would reflect more accurately what we do here to be named the Department of Computer Science and Engineering.

**The recent history of the department**
In 1984 the Computer Science Department joined the School of Engineering. Subsequently a degree program in Computer Engineering jointly coordinated by the administrative officers of the Departments of CSc and EL/EE was established. Ours is presently the only department in the School of Engineering without the designation "Engineering" in its name. Since we are in the School of Engineering, teach courses with an engineering flavor and jointly administer a program in Computer Engineering, it is fitting that this be reflected in our name.

**The designation of professional societies**
The IEEE Computer Society has proposed a "Model Program in Computer Science and Engineering\(^2\)," much of which is taught in this department. Thus it seems appropriate to designate our department in this way.

The most recent joint report of the ACM and IEEE Computer Society\(^3\) on employment of Ph.D.s for the first time includes departments offering degrees in Computer Engineering as well as Computer Science. The intention to integrate the figures for both degrees in the future is stated.

**Perception of others and its potential effect**
Faculty report that industry perceives our students as having skills which are appropriately called "Computer Science and Engineering". The new name would alert potential employers to this before hiring our students. This could be beneficial to our graduates as well as employers.

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\(^1\) The American Heritage Dictionary of the English Language; Houghton Mifflin Co; Boston

\(^2\) IEEE Computer Society order number 932; December 1983

\(^3\) The 1986-87 Taulbee Survey; in CACM; August 1988
Students who think of themselves as more interested in applications than in science may be more inclined to apply to a department of "Computer Science and Engineering." This could help provide a larger applicant pool.

There are several institutions which have departments named "Computer Science and Engineering". Cal Poly with its strong tradition of applying knowledge and skill and the precedent of having computer science in the School of Engineering has strong reasons for joining their ranks.
ACADEMIC SENATE RESOLUTION

WHEREAS, the Electronic and Electrical Engineering Department requested a name change to the "Electrical and Computer Engineering Department" as documented in its memo of May 10, 1989 from James G. Harris, Head, via Peter Y. Lee, Dean of the School of Engineering, to Malcolm Wilson, Vice President of Academic Affairs.

WHEREAS, the Computer Science Department which jointly administers with the EL/EE Department the Computer Engineering Program by its motion of May 2, 1989 voted to support the position "that the name of any particular department is primarily the business of that department", and

WHEREAS, the proposed name is particularly appropriate for the degree programs that it administers and the subject matter of its curriculum.

RESOLVED, that the name of the Electronic and Electrical Engineering Department be changed to the "Electrical and Computer Engineering Department" with due haste, and for incorporation into the 1990-92 University Catalog.
TO: Malcolm Wilson  
Vice-President of Academic Affairs

VIA: Peter Y. Lee, Dean
School of Engineering

FROM: James G. Harris, Head
EL/EE Department

DATE: May 10, 1989

SUBJECT: Request for Departmental Name Change

The EL/EE Department in its meeting on May 9, 1989, voted to change its name from the "Electronic and Electrical Engineering Department" to the "Electrical and Computer Engineering Department". The vote was 22 in favor, 2 against, and 0 abstentions.

On a subsequent vote, it was unanimously decided to implement the name change with due haste. The reason for this haste is the hope to include the new name in the 1990-92 catalog. The Computer Science Department, in response to consultation with the EL/EE Department on a possible EL/EE name change, in its meeting of May 2, 1989, passed the following motion: "The Computer Science Department feels that the name of any particular department is primarily the business of that department." The Dean of the School of Engineering also has indicated his support of the name change.

This name change is more representative of the programs supported by the department, and Attachment 1 indicates a number of variations for the names of departments which support our programs. This representative list seems to indicate a consensus on the proposed name.

The name change to Electrical and Computer Engineering is particularly appropriate since (a) the EL/EE Department administers, together with the Computer Science Department, the Computer Engineering degree program and (b) both Electronic Engineering and Electrical Engineering majors take courses in and emphasize digital computer techniques of logic design, computer processor (microprocessor) design, digital signal processing, digital communication systems, digital control systems, digital image processing, computer programming, and computer aided design.

We appreciate your support in expediting this request. If you have any questions, please do not hesitate to call.

Attachment
MEMORANDUM

TO: EL/EE Faculty

FROM: D. J. Winger
EL/EE Department

DATE: April 26, 1989

SUBJECT: What’s In A Name?

Prompted by the recent discussions concerning departmental names, I thought it of interest to see the names used by the other CSU and UC campuses as well as those of adjoining states. I am not attempting to draw any conclusions, but am sharing this with you as an informational item. You will note the high entropy of this information. (From March 1989 issue of Engineering Education.)

Cal Poly (Pomona)
  Electrical and Computer Engineering
  (no Computer Science listed in Engineering)

Cal State (Fullerton) - School of Engineering and Computer Science
  Electrical Engineering/Systems Engineering
  Computer Science

Cal State (Long Beach) - School of Engineering
  Electrical Engineering
  Computer Science and Engineering

Cal State (Los Angeles) - School of Engineering and Technology
  Electrical and Computer Engineering
  (no Computer Science listed in Engineering)

Cal State (Northridge) - School of Engineering and Computer Science
  Electrical and Computer Engineering
  Computer Science

Cal State (Sacramento) - School of Engineering and Computer Science
  Electrical and Electronic Engineering
  Computer Science
  (Note: Computer Engineering is listed as a division with a coordinator)

[Cal State Chico and Cal State Fresno were not listed.]
UC (Berkeley) - College of Engineering
   Electrical Engineering and Computer Sciences
   (Computer Science Division is listed with an associate chair)

UC (Davis) - College of Engineering
   Electrical Engineering and Computer Sciences

UC (Irvine) - School of Engineering
   Electrical Engineering
   (no Computer Science in Engineering)

UC (Los Angeles) - School of Engineering and Applied Science
   Electrical Engineering
   Computer Science

UC (San Diego) - Division of Engineering
   Electrical and Computer Engineering
   Computer Science and Engineering

UC (Santa Barbara) - College of Engineering
   Electrical and Computer Engineering
   Computer Science

ADJACENT STATES

Arizona (Tucson) - College of Engineering and Mines
   Electrical and Computer Engineering
   (no Computer Science listed in Engineering)

Arizona State - College of Engineering and Applied Sciences
   Electrical and Computer Engineering
   Computer Science

Nevada (Reno) - College of Engineering
   Electrical Engineering/Computer Science
   (under one department head or chair)

Nevada (Las Vegas) - College of Engineering
   Computer Science and Electrical Engineering

Oregon State - College of Engineering
   Electrical and Computer Engineering
STATEMENT BY ARCHITECTURAL ENGINEERING CONCERNING PROPOSAL FOR M.S. IN
STRUCTURAL ENGINEERING

The Academic Senate has before it a proposal, submitted jointly by the Departments of Architectural Engineering and Civil and Environmental Engineering, for a program of study leading to a Master of Science in Structural Engineering. In the spring of 1987, a similar proposal, prepared by the Department of Architectural Engineering, was recommended to the Academic Senate for approval by the Senate Curriculum Committee. The proposal by Architectural Engineering was withdrawn while it was under discussion on the Senate floor so that a new proposal for a joint program with Civil and Environmental Engineering could be prepared.

Many months of meetings between representatives from the two Departments followed and resulted in the joint proposal now before the Senate. The documents which constitute the agreement reached between the two Departments and their respective Deans are summarized below.

I. February, 1988: proposal forwarded by Botwin and Hockaday to Deans Ding and Lee.
   A copy of the cover memo is attached (Item 1). Note that the two Deans were requested to work out "appropriate administrative detail".

II. December, 1988: Proposal for a Management Model forwarded by Deans Ding and Lee to the Vice President for Academic Affairs.
   A copy of their cover memo is attached (Item 2). Note that they had stated "We look forward to your early approval of this model and to the implementation of the program with the 1990-92 catalog". (Underlining is ours.)

III. January, 1989: revised Management Model sent from VPAA to Deans.
   A copy is attached (Item 3).

IV. Spring 1989, final proposal sent to Senate Curriculum Committee.

   The final version of the proposal was prepared by Botwin and Hockaday and transmitted to the Senate Curriculum Committee through Deans Ding and Lee. The proposal as transmitted had received the unanimous endorsement of the faculty of the Department of Architectural Engineering, was signed by Botwin, Hockaday, Ding, and Lee. That proposal is the document now before the Senate for its
consideration. The courses to be offered include some new courses and some courses which are to replace certain existing courses which are currently offered by both Departments, including some which are duplicated in the two Departments. These existing courses were to be deleted. Architectural Engineering has complied with these agreements by submission of the catalog copy (Item 4) deleting these existing courses.

V. Spring 1989: proposal is tabled by Senate Curriculum Committee.

In the process of Senate Curriculum Committee review of catalog copy submitted by Civil and Environmental Engineering, it was discovered that C&EE had retained courses which they had previously agreed to delete. As a result of the discrepancy between the proposed graduate program and the catalog copy submitted by Civil and Environmental Engineering, the proposal was tabled by the Senate Curriculum Committee. The unanimous position of the Architectural Engineering faculty is expressed in the memorandum from David Hatcher, then Interim Department Head of Architectural Engineering, to Stephen Hockaday, a copy of which is attached (Item 5).

VI. June 1989: both Departments directed to comply with the proposal as submitted.

It had appeared that this detail was resolved by the memorandum from William Rife, Interim Associate Vice President for Academic Programs, dated June 27, 1989 to the two Deans, a copy of which is attached (Item 6). In essence, it directed both Departments to comply with the details of the proposal which is now under consideration. Architectural Engineering has complied, Civil and Environmental Engineering has not.

We ask the Senate to vote to approve the proposal on its undisputed merits.
MEMORANDUM

TO : Gar Day Ding, Dean, SAED
     Peter Y. Lee, Dean, SENG

FROM : Michael Botwin, Chair, Architectural Engineering
       Stephen Hockaday, Chair, Civil & Environmental Engineering

RE : GRADUATE CURRICULUM IN STRUCTURAL ENGINEERING

Date : February 4, 1988

Following a series of meetings between interested faculty members of the two Departments, we have agreed on a proposed graduate curriculum in Structural engineering.

The proposal is attached to this memo. We request that you give this proposal prompt consideration so that appropriate administrative arrangements can be made to implement the curriculum as soon as feasible.

We are ready to meet with you to provide further information as needed. We suggest that we have a meeting of the Structural Engineering Council on or about February 18, to resolve any outstanding items.

attachments
MEMORANDUM

TO : Malcolm Wilson, V.P.
    Academic Affairs

FROM : Gar Day Ding, Dean, SAED
       Peter Y. Lee, Dean, SENG

RE : MANAGEMENT MODEL FOR M.S. IN STRUCTURAL ENGINEERING

Date : December 9, 1988

We are pleased to be able to report that, following lengthy and intensive
analysis and review, we have developed a viable management model for subject
program.

This model will permit the development of an interdisciplinary degree program,
and could also act as a model for other interdisciplinary programs.

Details of the management model are attached. We look forward to your early
review and approval of this model and to the implementation of the program with
the 1990-92 catalog.

attachment
Memorandum

To: Gar Day Ding, Dean
   School of Architecture and Environmental Design

   Peter Y. Lee, Dean
   School of Engineering

From: Malcolm W. Wilson
   Vice President for Academic Affairs

Date: January 31, 1989

File No.: 

Copies: Michael Botwin
         Stephen Hockaday

Subject: Management Model for the M.S. in Structural Engineering

Per our discussion on January 27, 1989, attached is a revised version of the management model received in this office on December 13, 1989. For convenience of review I will note where the changes occur. Items 1, 2, 3, 5, 6, and 7 are unchanged from your original version.

Item 4 has been revised to be specific that the Program Committee recommends which courses are to be taught which quarters and which faculty should teach them.

Item 8 has been eliminated. In its place is a procedure which should address the underlying concerns of both items 8 and 10.

Item 9 will have to be worked out within the total context of enrollment planning for the campus. However, I believe it is safe to assume that provision will be made for students to enroll in the program.
Management Model for M.S. in Structural Engineering
Joint Proposal by Dean G. Ding and Dean P. Lee

1. The Degree program will be managed by a Program Committee composed of:

   Civil and Environmental Engineering Department Chair
   Architectural Engineering Department Head
   1 faculty representative each from Civil and Environmental Engineering and Architectural Engineering Departments
   1 non-voting faculty representative each from Aeronautical Engineering and Mechanical Engineering Departments

2. The Program Committee will report to the Deans of the School of Engineering and School of Architecture and Environmental Design.

3. Of the eleven courses in the Program shown on the attached list, ten will carry a Structural Engineering (SE) prefix and one will carry a Civil Engineering (CE) prefix.

4. The Program Committee will recommend which SE prefix courses are to be offered, which quarters they will be offered, and which faculty will teach them to the Deans of the School of Engineering and the School of Architecture and Environmental Design.

5. SE faculty assignments and instruction data will be reported as a section under the School of Engineering.

6. This Management Model will be adopted initially for two years, and is subject to revision by the mutual written agreement of the two Deans, as necessary during this trial period.

7. The M.S. in Structural Engineering program will carry identical catalog references under each School and have a separate full listing under interdisciplinary programs.

8. All resource entitlements from student credit units generated by SE prefix courses will go into an independent account to be applied toward support of the M.S. in Structures. These resources will be allocated by the Deans of the School of Engineering and the School of Architecture and Environmental Design in accordance with the instructional needs of the program.

9. During the first two years of the implementation of the M.S. in Structures, an allocation separate from that of the two schools involved will be made to the program. In the initial year the allocation will be negotiated based on the proposed pattern of course offerings. In the subsequent year, a portion of the allocation will be generated through the mechanism of the faculty allocation model, and the remainder will again be negotiated based on the proposed pattern of course offerings. The entire process will be evaluated prior to the third year, but it is
anticipated that the program will then operate on its own earnings with augmentations, if any, coming from the Schools of Engineering and Architecture and Environmental Design.
ARCE 304 Timber Design (3)
Analysis and design of timber structures subject to gravity and lateral loads with emphasis upon the detailed design of members and connections. 3 lectures. Prerequisite: ARCE 223.

ARCE 305 Masonry Design (2)
Analysis and design of masonry structures subject to gravity and lateral loads, load-bearing walls, shear walls, columns and beams, structural details. 2 lectures. Prerequisite: ARCE 223.

ARCE 306 Matrix Analysis of Structures (3)
Analysis of statically indeterminate structures by force and displacement methods, including programming for digital computer applications to beams, rigid frames, plane and space trusses, and other structures. 3 lectures. Prerequisite: ARCE 302.

ARCE 311 Structures for Landscape Architects (3)
Basic principles of structures and design of landscape structures. 3 lectures.

ARCE 321 Timber Design (3)
Timber structures; limitations and potential of the material in relation to the design and construction process. For architecture and construction students. 2 lectures. Prerequisite: ARCE 226, ARCH 232.

August 10, 1988
Memorandum

To: Steve Hockaday, Department Chair
   Civil and Environmental Engineering

From: David Hatcher, Department Head
       Architectural Engineering

Subject: M.S. PROGRAM IN STRUCTURAL ENGINEERING

Date: June 5, 1989

FILE NO.: D. Ding
           P. Lee

Copies: D. Ding
         P. Lee

1. A proposal for a Master's Degree Program in Structural Engineering (MSSE), which has been developed over a period of several years by a joint committee comprised of faculty members from the Departments of Architectural Engineering and Civil and Environmental Engineering and the Departmental Head and Chair from the two departments, is now under review by the Senate Curriculum Committee. As a part of that proposal, it was agreed by members of the joint committee that certain courses from the two Departments, which were concerned with the same subject matter, would be merged into a set of four new courses which would carry an SE prefix. It was further agreed by members of the joint committee that the existing Departmental courses would be dropped by both Departments. The courses in question are listed below:

<table>
<thead>
<tr>
<th>Existing Courses</th>
<th>New Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 405</td>
<td>SE 405 Advanced Strength of Materials</td>
</tr>
<tr>
<td>CE 407</td>
<td>SE 407 Dynamics of Structures</td>
</tr>
<tr>
<td>CE 554</td>
<td>SE 455 Matrix Analysis of Structures</td>
</tr>
<tr>
<td>CE 558</td>
<td>SE 558 Finite Element Analysis</td>
</tr>
</tbody>
</table>

The faculty of the Architectural Engineering Department endorsed the proposal by the joint committee and the courses in question bearing an ARCE prefix were to have been dropped from the 1990-92 catalog pending approval of the proposed graduate program by the office of the Chancellor of the CSU. It has been reported that the faculty of the Civil and Environmental Engineering Department did not endorse the proposal to drop the courses in question and they are retained in the CEE curriculum proposal for the 1990-92 catalog. As a result of this departure from the proposal of the joint committee and from the proposal now under review by the Senate Curriculum Committee, the Senate Curriculum Committee has tabled the proposal thus jeopardizing Campus approval of the proposed joint program.

2. It is the unanimous position of the faculty of Architectural Engineering that the proposal of the joint committee should be followed by both Departments.
3. The joint committee agreed that there is to be only one graduate program in Structural Engineering at Cal Poly and that has been affirmed by the Vice President for Academic Affairs. However, the description of the MSCEE shown on page 60 of the CEE submission for the 1990-92 catalog retains a description of a structures option in the MSCEE program which is unchanged from the current catalog description shown on page 3. It is the position of the faculty of the Architectural Engineering Department that: there be no graduate structures option in the MSCEE program, that there be a written statement to that effect by the Vice President for Academic Affairs, and that the catalog description of the MSCEE program clearly state that prospective students who are interested in graduate study in structures are to enroll in the MSSE program.
Memorandum

To: Day Ding, Dean
School of Architecture & Environmental Design

Peter Lee, Dean
School of Engineering

From: Interim Associate Vice President for Academic Programs (2246)

Subject: M.S. in Structural Engineering (SE)

Date: June 27, 1989

Your proposal for an M.S. in SE has been tabled in Senate Curriculum Committee. As a result of our meeting on June 21, I'm asking that you work with Dave Hatcher and Steve Hockaday to take the following steps before September 1, so that the Committee will be able to make a recommendation on the proposal early in Fall Quarter. Each of the following items should be sent to Christina Bailey, Chair of the Committee, with a copy to Mary Whiteford, Catalog Coordinator; if you have questions about the form of these items, please ask Mary.

1. A request from Civil Engineering to delete CE 405, 407, 554, and 558 if the SE program is approved.

2. A request from CE to delete the words "structures and" in the phrase "structures and geotechnical engineering" at page 230 in the current catalog.

3. A request from ARCE and from CE for an identical footnote at an appropriate point in each department's catalog section, referring the reader to the description of the SE program at another location in the catalog. The SE program will be located in a new interdisciplinary section.

4. A statement from ARCE and CE that their proposal for the SE program includes the understanding that, if the program is not successful, the ARCE and CE courses deleted to implement it will be automatically reinstated.

These documents should come forward with written approval from the department heads and from you.
MASTER OF SCIENCE DEGREE IN CIVIL AND ENVIRONMENTAL ENGINEERING

General Characteristics
The Master of Science program in Civil and Environmental Engineering has the following objectives:

- Job-entry education for the more complex areas of engineering, such as research and development, innovative design, systems analysis and design, and managerial engineering;
- Updating and upgrading opportunities for practicing engineers;
- Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree;
- A base which allows graduates to maintain currency in their fields.

Prerequisites
For admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted. Applicants for graduate engineering programs are required to submit satisfactory scores for the General (Aptitude) Test and Subject (Advanced) Test of the Graduate Record Examination in engineering. An applicant who meets these standards but lacks prerequisite course work may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, Civil and Environmental Engineering Department.

Program of Study
Graduate students must file a formal study plan with their adviser, department, school and university graduate studies office by no later than the end of the quarter in which the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 24 of which must be at the 500 level). With the graduate adviser's approval, students will be expected to select their elective units in one of the following areas of study: structures and geotechnical engineering, transportation and planning, or water resources and environmental engineering.

The broad curriculum requirements for the M.S. in Civil and Environmental Engineering are:

- a) a core of 17 units as required;
- b) a minimum of 9 units of adviser approved electives;
- c) a minimum of 9 units chosen from mathematics, statistics, computer science, or from an approved list of analysis courses, with at least 3 units at the 500 level;
- d) the remaining units taken from a list of approved electives;
- e) at least 24 units of the 45 unit program at the 500 level.

Two program options are available for M.S. in Civil and Environmental Engineering students: a thesis program which requires course work, a thesis and oral defense of thesis; or a nonthesis option which involves additional course work and a comprehensive examination. The nonthesis option is normally allowed only for those students who have completed an undergraduate senior project or have had significant engineering project experience.

Curriculum for the Master of Science Degree in Civil and Environmental Engineering

Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 571</td>
<td>Selected Advanced Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CE 574</td>
<td>Computer Applications in Civil Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CE 591</td>
<td>Graduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>CE 599/ENVE 599</td>
<td>Design Project (Thesis)</td>
<td>2 (2) (5) or 9 units of approved technical electives</td>
</tr>
</tbody>
</table>

Adviser approved electives
To be selected from the following with adviser's approval:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 405</td>
<td>Advanced Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>CE 407</td>
<td>Structural Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>CE 422</td>
<td>Geometric Design of Highways</td>
<td>4</td>
</tr>
<tr>
<td>CE 424</td>
<td>Public Transportation</td>
<td>4</td>
</tr>
<tr>
<td>CE 431</td>
<td>Coastal Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>CE 434</td>
<td>Ground Water Hydraulics and Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>CE 407</td>
<td>Rock Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>CE 521</td>
<td>Airfield and Highway Pavement Design</td>
<td>4</td>
</tr>
<tr>
<td>CE 522</td>
<td>Advanced Transportation Design</td>
<td>4</td>
</tr>
<tr>
<td>CE 523</td>
<td>Transportation Systems Planning</td>
<td>4</td>
</tr>
<tr>
<td>CE 525</td>
<td>Airport Planning and Design</td>
<td>4</td>
</tr>
<tr>
<td>CE 527</td>
<td>Traffic Engineering - Operations and Controls</td>
<td>4</td>
</tr>
<tr>
<td>CE 533</td>
<td>Advanced Water Resources Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CE 554</td>
<td>Matrix Analysis of Structures</td>
<td>3</td>
</tr>
<tr>
<td>CE 558</td>
<td>Introduction to Finite Element Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CE 559</td>
<td>Advanced Structural Design</td>
<td>3</td>
</tr>
<tr>
<td>CE 573</td>
<td>Public Works Administration</td>
<td>3</td>
</tr>
<tr>
<td>CE 584</td>
<td>Advanced Soil Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>CE 585</td>
<td>Advanced Soil Mechanics II</td>
<td>3</td>
</tr>
<tr>
<td>CE 586</td>
<td>Advanced Foundation Engineering</td>
<td>4</td>
</tr>
<tr>
<td>ENVE 411</td>
<td>Air Pollution Control</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 421</td>
<td>Mass Transfer Operations</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 434</td>
<td>Water Quality Measurements</td>
<td>2</td>
</tr>
<tr>
<td>ENVE 436</td>
<td>Introduction to Hazardous Waste Management</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 439</td>
<td>Solid Waste Management</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 441</td>
<td>ENVE 442 Advanced System Design</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 465</td>
<td>Environmental Management and Urban Systems</td>
<td>2</td>
</tr>
<tr>
<td>ENVE 534</td>
<td>Advanced Design of Pollution Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 535</td>
<td>Advanced Wastewater Treatment</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 536</td>
<td>Biological Wastewater Treatment Processes</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 541</td>
<td>Resource and Energy Recovery from Waste</td>
<td>3</td>
</tr>
</tbody>
</table>

Required Quantitative Techniques Courses

A minimum of 9 units chosen from CSC, MATH, STAT or from an approved list of analysis courses with at least 3 units at the 500 level.

Approved technical electives