

DRAFT as of February 24, 2009

**College of Engineering
Academic Plan
February 2009**

College of Engineering

MISSION

The task of the College of Engineering is to educate men and women as engineers and technologists to meet increasingly more complex technical and socio-economic challenges in a global economy. Our students of today represent a diverse cross section of the population and will be among tomorrow's leaders. Moreover, we seek to provide graduates who are immediately able to contribute to industry or to the public sector and are prepared to seek higher academic achievement as well. The success of this mission, in keeping with the polytechnic mandate of this University, is critical in assuring the future prosperity of California through technological advancement.

We are committed to the following goals:

1. Maintaining curricula which emphasize problem-solving skills, laboratory proficiency, communication competency, interdisciplinary teamwork, leadership, development, and which demand mastery of sound theoretical bases in mathematics, science and engineering fundamentals at both the baccalaureate and masters level;
2. Incorporating into the programs of study topics which have overarching importance to professional practice including safety, finance, sustainability and systems engineering;
3. Assuring the relevancy and contemporary nature of programs through collaboration among the faculty, staff, alumni, industry leaders, and other universities;
4. Developing in each student a strong sense of professionalism, a set of high ethical standards, and the pride that comes from accomplishment;
5. Providing an environment in which each person, including nontraditional and underrepresented students, can achieve personal excellence as part of a lifelong commitment to learning;
6. Sustaining the unique qualities of the College's faculty by seeking practicing scholars with both advanced degrees and substantial professional experience;
7. Supporting and recognizing innovation, technological advances, and excellence in teaching coupled with rigorous assessment;
8. Promoting an environment focused on scholarship and applied research by the faculty and fostering interaction among faculty, staff, university, colleagues, students and practicing professionals; and
9. Exercising careful stewardship of private and public resources provided to operate and improve the College's programs.

College of Engineering
VISION
Going from Good to Great!

We envision ourselves as the institution most widely recognized by both the engineering and education professions for excellence in providing productive practitioners to the technical community. Guided by a commitment to ever-increasing quality in producing tomorrow's leaders, we follow these principles:

- Meeting societal needs is the goal, knowledge is the tool, a learning-centered environment is the vehicle.
- Faculty are engineers who are educators, with significant engineering experience being a requisite for good teaching.
- Curricula are rigorous, up-to-date, relevant, and globally competitive as part of our campus learning-centered environment.
- University-Technical Community ties that produce benefits for all parties.
- Facilities are consistent with best engineering practice.
- Planning for the future is strategic in nature.

Goals: Cal Poly Pomona engineering graduates are expected to be innovative, creative and should rank among the top engineering graduates in the nation.

Strategic Direction: Recruit and retain *high quality students* into engineering programs. This may be achieved through:

- Outreach to honor students and offering Engineering Honors courses
- Admission criteria and impaction
- Project Lead the Way
- Outreach to students from community colleges
- First Year Experience
- Undergraduate research opportunities

The College of Engineering offers unique programs, learn by doing or hands-on experience that can be used as a selling point to attract high quality students. These students are expected to be well prepared to take engineering courses as planned, and they will graduate in a timely manner. It is known that three years and six years graduation rates are positively correlated with the quality of incoming students. Students' progress will be assessed using ABET assessment criteria already in place.

Goals: All COE goals

Strategic Direction: *Recruit, retain, and develop high quality faculty and staff.*

Both ABET and WASC have identified the ratio of tenured, tenure-track faculty to students as a major area of concern. Over the past 15 years, both the absolute number and the percentage of tenure, tenure-track faculty compared to lecturers have declined. The overall effect is a higher workload for all tenured, tenure-track faculty members. A similar trend for staff exists. This impacts all aspects of the COE's strategic plan. Without sufficient and highly qualified personnel, it will be impossible to meet strategic goals. We propose to reverse this trend through the following actions:

- Increase the % of FTES taught by tenured, tenure-track faculty from 50% to 85%.
- Actively seek industrial support for faculty salary and start-up funding.
- Explore joint faculty appointments across departments and colleges.
- Increase the visibility and awareness of the COE at CPP to graduate students, post-docs, and local industry to recruit faculty and staff.
- Encourage discussion of work-life balance in all recruitment activities.
- Provide the opportunities for both formal and informal mentoring to all faculty members and staff.

Goals: Faculty retention and development; Supporting programs of distinction; Relationship with industry and alumni

Strategic Direction: Present a *Speaker Series/Colloquium* for faculty

The creation of a Speaker Series/Colloquium intended for an audience of engineering faculty has as its main purpose to provide additional interdisciplinary development opportunities to the faculty in the college. In general, Engineering faculty spend most of their time preparing classes and researching within areas close to their area of expertise and do so because of time constraints. However we believe that interdisciplinary knowledge is essential for the full career development of professors and that research and course development opportunities may be found in the interconnections between disciplines. It also exposes attendees to industry and academic developments not necessarily published and available to the community. Speakers will be alumni or others from various engineering disciplines.

The Speaker Series/Colloquium provides also informal opportunities for faculty of various disciplines to interact between them and with people external to the campus. This interaction may be beneficial for the individual as well as for the whole college, and leads to a friendlier work environment.

Goals: Raising student quality; Supporting programs of distinction; Collaboration among colleges and departments

Strategic Direction: *Enhance communication and leadership skills* of students in the COE.

Representatives from industry consistently rate communication and leadership skills as highly important for the future success of engineering graduates. These skills are important for ABET accreditation as well. Engineering courses include many writing and speaking assignments. Engineering students have opportunities for developing leadership skills through team projects, engineering student clubs, and engineering student competitions. The COE at CPP intends to improve student quality and enhance our programs of distinction through collaboration among colleges and departments aimed at improving communication and leadership skills of engineering students. We plan to accomplish this through the following activities:

- Invite representatives from other Colleges on campus to observe the College of Engineering Project Symposium presentations to assess student communication skills and recommend areas for improvement.
- Provide professional development opportunities for faculty on how to develop and evaluate professional/technical writing and speaking assignments.
- Develop and present workshops for engineering students on writing, speaking, and leadership.
- Continue to enhance the annual Engineering Club Leadership Retreat.

Goals: Raising student quality; Supporting programs of distinction; Collaboration among colleges and departments; Enhance and sustain diversity

Strategic Direction: *Teamwork* will become part of the culture in the COE.

Although engineering programs across the country have recognized the collaborative nature of engineering and have required their students to work in teams in labs and projects, most engineering faculty have not experienced ways in which to encourage, moderate, and assess teamwork. Furthermore, much of the climate issues within engineering (with respect to issues such as gender and racial discrimination, and poor communication skills) are manifested within these teams, and if not properly addressed, can actually contribute to the attrition of under-represented population within engineering. These skills are important for ABET accreditation as well. The COE at CPP aims to enhance the quality of our students and distinguish them by their ability to work in teams through the following actions:

- Provide professional development opportunities for faculty on how to encourage, moderate and assess teamwork.
- Make teamwork a major part of the assessment in several laboratory and project courses.
- Provide faculty-led workshops (within or in addition to current courses) for students on how to form teams; how to communicate within a team; and how to work effectively as a team.

Goals: Raising student quality; Enhance and sustain diversity

Strategic Direction: Best practices for *Advising at Risk Students* will be determined and disseminated. This will include Identification, Advising, and Feedback.

Identification : The key to successful advising of at risk students is early identification of such students. In order to do this, students' performance must be monitored starting with their first quarter at CPP.

Advising : Once the at risk students are identified, they must be required to see and consult with their advisors before they are allowed to register for classes. These students should be encouraged to take advantage of programs such as MEP. They must also be advised that tutoring is usually available at the LRC and other sources, and they should be encouraged to join study groups and benefit from other students' knowledge.

A mentoring program may also be devised so that high achieving junior and senior students are paired with struggling freshmen and sophomore students to be helped with their studies. Junior and senior students may be paid on an hourly basis for their work. Although this introduces an extra expenditure, in the long run it will more than pay for itself by avoiding failure grades which result in students taking some courses a number of times.

In addition, a course of action must be developed for at risk students (i.e. number of units, number of hours worked, etc.) that will allow them to remedy their deficiencies.

Students who are found to be struggling with remedial and even pre calculus mathematics (Algebra and Trigonometry) courses must be warned that engineering is a math intensive field, and unless they improve their knowledge of mathematics their chances of success will be small.

Feedback : At risk students must be monitored on a quarterly basis until such time when they are no longer in danger of going back on probation. This monitoring serves as feedback on the success of the advising process. Of course, regardless of how hard we may try, there will always be some students who will not be able to successfully complete their studies in engineering and get a degree. Such students must be advised to transfer out of engineering as soon as they are identified.

Goals: Graduate Education, Faculty recruitment and development, Raising student quality, Undergraduate Research, Learn-by-Doing, Supporting programs of distinction, Non State Resources, Relationship with Industry/Stakeholders

Strategic Direction: *Development of non-state resources by the College of Engineering*

The College of Engineering has traditionally undertaken the solicitation of grants from the US government, NSF in particular, and monetary support from local industry supporters and will continue to do so. In addition the College of Engineering ADCOM group identified course and lab based fees as an area of investigation.

Current Situation: The College of Engineering has traditionally not assessed course based fees. Supplies and materials required in the laboratories generally were provided by the college. One notable area of exception is in basic electronic supplies which students purchase on their own to complete given laboratories. The working condition of electronic components is extremely difficult to assess and it is an accepted norm that once purchased electronic components cannot be returned or reused by other students. The cost of such materials which are often applicable for many laboratories is estimated to range from \$10 to \$30 for items like test leads and prototyping supplies and are available from a variety of local retailers. In some cases more complex and expensive microprocessors and advanced electronics (up to \$150) are purchased by students through manufacturer discounted educational sales and are spread across several students and laboratories. The College of Engineering through the Electrical and Computer Engineering Department does provide some small electronic components free of charge primarily from surplus parts provided by local industries.

Course and lab based fees under investigation: The adhoc CoE laboratory fees group has been investigation the types of fees charged across the university in particular Category III and IV fees outlined in the Chancellor's Office EO 1034 dated 6/11/08. Category III fees are Miscellaneous

Course Based fees and Category IV fees are other fees. The majority of the Category III based fees at Cal Poly Pomona are associated with Arts or Foods based instruction. The committee is currently collecting information from programs having Category III fees to learn if CoE laboratories exhibit similar circumstances and also collecting information from CoE departments on laboratory based expenditures that may be considered Category III fees. One other area of fees being investigated is generalized computer lab based support specifically printing costs. The College of Engineering has for many years provided printing capabilities at “no cost” for students in all of its laboratories. The cost of providing such services is estimated to be \$25,000 per year. The College of Engineering computer system already allocates a cost per student course and laboratory but the students are not charged for this service. The fees committee plans to collect information with regards to this cost for possible submission to the campus Fee Advisory committee.

Campus based Technology Fee: Cal Poly SLO implemented a campus wide Technology based fee many years ago and the details of this fee are also being investigated.

Goals: Identify space needs and available space in existing buildings, and propose solutions

Strategic Direction: Develop *strategy for satisfying CoE space needs*, and input this strategy into the campus master plan

Our “learn by doing” philosophy of education requires significant space for laboratories and other activities, and many current and proposed activities do not have sufficient space. In addition, additional emphasis on externally-funded projects, including industry and government research contracts, grants, and partnerships, places greater demands on laboratory facilities, many of which are not currently being met. Identified needs include the following:

- Additional faculty offices
- Additional laboratory space to support senior projects and special student projects, particularly those that require fabricating objects out of metal, wood, composites, concrete, and other materials
- Additional laboratory space to support new and upgraded instructional and research capabilities
- Additional computer laboratories
- Project rooms to support team projects

From an operations perspective, there would be many advantages to locating these new facilities primarily in Building 13, and possibly in Buildings 9 and 17. Other colleges currently occupy significant portions of Buildings 9 and 13, but their operations are much more amenable to being moved elsewhere. The most notable of these is the Art Department, which currently occupies more than half of Building 13. In addition, Building 13 was constructed for the purpose of supporting engineering laboratories, and for many years was used primarily by Aerospace,

Chemical & Materials, and Industrial & Manufacturing Engineering. It is well-suited for that purpose. Finally, there is limited potential for constructing new buildings in the vicinity of the engineering complex.

The Art Department is an important part of the campus community, and needs to have sufficient space to support their activities. Thus, we recommend the campus master plan include provisions for new space to house the Art Department. Such a move would support their activities as well or better than Building 13, and would create the additional space needed to support the College of Engineering's unmet space needs.

Goals: Updating of critical equipment, and a plan for doing so.

Background: One of the keys to remain competitive and up-to-date in a learn-by-doing educational system is to have facilities and equipment consistent with the best engineering practice. Although all departments recognize the importance and the needs in this area, there is a lack of concerted effort in this area. Each department seems to have resigned to work independently seeking grants or funds for equipment acquisition. While everybody recognizes the need of equipment repairing and upgrading, there is no indication of specific lists of needed equipment. Equipment in the engineering fields is for the most part very expensive to maintain and in many cases hard to replace for lack of funds. Many pieces of equipment are obsolete, but there is a sense that it is easier to adjust the curriculum to the existing equipment than to do something about it. This results in stagnation of the curriculum and makes it very hard to keep up with the state of the art. Faculty is generally disappointed with the economy and there is an identifiable lack of motivation in finding a solution to the equipment problems. The assessment carried so far has not turned out substantial equipment needs feedback, except from two departments.

Strategic Direction: The faculty needs to be educated and strongly encouraged to engage in a concerted effort to upgrade their laboratories to state of the art equipment. A specific college committee for equipment upgrading and integration in the curriculum needs to be meet, with representatives from each department. Such representatives need to be versed in the various department needs, curriculum, state of the art in their areas, and be knowledgeable of the costs involved. Equipment repairing and upgrading costs need to be specifically identified by each department. The assessment needs to be linked to proposals for laboratory fees to support mostly equipment breakage and repairing. Donors need to be identified and targeted for specific equipment upgrading, in full, or as part of a partnership. This goal can only be successful with more inter-departmental collaboration for equipment fund raising. Once equipment needs are identified that can serve more than one field, and serving more students, it makes a stronger case. A "justification" folder needs to be prepared with costs information per piece of equipment, supported with an impact study to the curriculum and the stakeholders. Our industry supporters would then be identified and aimed based on the specific fields identified.