School of Engineering
Strategic Vision and Plan, 2017-2022

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INTRODUCTION

The School of Engineering (SoE) is the one of the youngest engineering schools in the nation and the youngest in the University of California system. In the eleven years since the first freshmen arrived on campus, the School has expanded gradually over time and has developed a small cadre of excellent academic programs.

Over the next five years, the School will enter a rapid growth phase, one associated with the ambitious Project 2020 construction project that will open sizeable new facilities and opportunity for growth, both in terms of students and faculty. With this opportunity, the School must plan strategically to strengthen existing programs and develop focused new ones.

This rapid growth scenario requires careful, thoughtful, yet flexible planning for resources and infrastructure. The School of Engineering is committed to becoming a recognized leader in engineering innovation and education.

The School of Engineering held a school-wide retreat in October 28-30, 2016 at an off-site location to review the current state of the School and to develop future directions and aspirations in five key areas: vision/mission/communications, research, graduate education, undergraduate education, and administrative services.

In advance of the retreat, faculty and staff members were asked to select and participate in one of the area committees to perform an assessment of the current state associated with their area, identify desirable changes, and propose objectives/outcomes for their respective areas.

At the retreat, each committee reported on their assessment and proposed goals to all faculty and staff members. Following those reports, faculty and staff were asked to participate in an area breakout session that differed from their pre-retreat area participation. Discussion and refinement of the initial findings led to a revised set of proposed objectives/outcomes.

This strategic plan document reflects the list of desired changes and objectives/outcomes that were generated from the all-School retreat.

FOUNDATIONS FOR THE SCHOOL OF ENGINEERING

Mission

The mission of the School of Engineering at the University of California, Merced is to:

- Transform students into tomorrow's leaders,
- Create a continuously improving environment in which outstanding faculty, students, and staff thrive in research, education and service, and
- Make local and global impact by creating solutions and developing technologies that address society's challenges.

Vision

Our vision is to become a recognized world leader in engineering innovation and education.

Values

The School of Engineering values collaboration, creativity, integrity, strong work ethic, life-long learning, and responsibility for improving our world sustainably.

Goals

- Our school aims for excellence through educating future leaders in engineering who understand the context in which they live and work, and who are comfortable with managing and driving change. We will focus on developing innovative education that provides deep engineering competence, promotes high ethical standards, and delivers solutions to our challenges in an economically, environmentally, and socially responsible manner.
- We seek to be internationally recognized for our cutting-edge, interdisciplinary research by focusing on select, high profile areas, and attracting the best faculty and graduate students to build our signature areas of distinction. We will strive to be on par with our sister UC campuses in the quality and impact of our research.
- As a diverse school and campus, we seek to leverage our diversity to be innovative and distinct, and apply our knowledge to solving important problems related to our human and natural environments. We will achieve this by attracting a dynamic faculty, and grafting sustainability into our culture, education, and research.
- We strive to engage our communities, and to promote a value exchange between our students, our faculty, and our communities. By using the local region as our lab, we aim to solve global problems by finding sustainable solutions to the local challenges, incubate the creation of new enterprises and good jobs, and facilitate prosperity of the San Joaquin Valley.

Guiding Principles

A number of guiding principles were used for this strategic plan; principles that we believe will hold true for all subsequent strategic plans.

- We must emphasize excellence in the research, education, and service that we deliver.
- We must create an environment that attracts outstanding faculty and staff.
- We must create an environment that attracts outstanding students, both at the undergraduate and graduate levels.
- We must develop an entrepreneurial mindset that promotes innovation in research, education, and service, while being cost effective in its operations.
- We will foster ethical leadership among a diverse community within our faculty, staff, and students.
- We must strive to gain recognition for our positive contributions in research, education, and research.

Five-Year Aspirations

The progress and success of the strategic vision and plan will be assessed by marking progress towards, and meeting the aspirations described below.

- Ranked within the top 100 graduate engineering schools by the U.S. News & World Report. (UC Merced is unranked currently in the list of graduate engineering schools.)
- Surpass $25 million in annual research expenditures and awards. (Awards in AY 2016 were $12.3 million (includes SNRI and CITRIS) and expenditures were $6.4 million (does not include SNRI and CITRIS).
- Achieve an average of one Ph.D. awarded per faculty member every other year or better. (Current average based on AY2016 doctoral degrees awarded is one Ph.D. awarded per faculty member every four years.)
- Achieve an average of one M.S. awarded per faculty member every year or better. (Current average based on AY2016 M.S. degrees awarded is one M.S. awarded per faculty member every three years.)
- Increase and limit the undergraduate enrollment to 2,000 and/or a student-to-faculty ratio of 25:1. (Fall 2016 undergraduate enrollment was 1,698 and the student-to-faculty ratio was 40.)
- Increase four-year and six-year graduation rates by an average of 15 percent each. The latest four-year and six-year graduation rates are 13% and 38%, respectively.
- Exceed 80 percent job placement of graduates within one year of graduation. (The current job placement rate of SoE graduates within one year of graduation is not available for the AY 2015 graduating class.

ANALYSIS

A summary of the School of Engineering's current strengths, weaknesses, opportunities, and threats as assessed by the dean is provided in the following section.

Strengths

- The SoE faculty as a collective is consistent with the quality of peers at many top national universities and within the University of California.
- The SoE faculty is committed to continuing growth efforts of the School and campus, and improving research, education, and service programs.
- Most SoE faculty members have active research programs and provide excellent instruction at the undergraduate and graduate levels.
- The SoE has dedicated staff members who are committed to serving the needs of the students and faculty members.
- The campus and the SoE have a diverse student body, who are committed to learning and have a strong work ethic.
- Engineering Service Learning, Innovation and Design Clinic (Capstone Design), and the Mobile App Challenge are meaningful programs that prepare our undergraduate students to enter the professional workforce.

Weaknesses

- The SoE is much smaller in terms of faculty and staff size than those of our aspirational peers.
- The campus and the SoE suffer from a lack of visibility as to the quality of our faculty, students, research, and educational programs.
- As a relatively new campus and school, we have a small and young alumni population, which limits opportunities for financial support and networking.
- Staff and other institutional resources in key areas as well as research infrastructure limit SoE ability to carry out the mission of research, teaching, and service effectively.

Opportunities

- SoE faculty research interests are consistent with the campus Strategic Area Focus efforts, giving us an opportunity to add SoE-affiliated faculty beyond foundational hires.
- Project 2020 will provide much needed opportunity to expand enrollments and increase faculty size and infrastructure. The expectation is that the number of SoE faculty members will increase by 35 to 40 over the next five years (includes those in SAFI).

- Companies within the San Joaquin Valley and the Bay Area have a strong interest in connecting with the SoE because of our diverse, well-trained engineering students. These connections can provide opportunities for faculty interactions (research and consulting).

Threats

- Continued unrestricted enrollments in popular undergraduate majors (and the School in general), without concomitant added resources will damage SoE and campus reputation. Likely results include poor quality educational experience for our students (large classes, poor retention), minimal graduate enrollment, and lower faculty research activity compared to our peers.
- Lack of a long-term planning strategy may result in misdirection of precious resources. We need priorities for investing. The opportunity window is extremely small.
- All faculty members need to appreciate and participate in all of the UC mission objectives – service, teaching, and research. Failure to do so results in resentment, shared governance dysfunction, and inequities in workload and merit/promotion.

STRATEGY AND ACTIONS

Improve Reputation (Ranking)

- Focus on improving criteria metrics that are associated with the U.S. News and World Report graduate engineering school ranking methodology.
- Develop and implement a communications plan that publicizes the quality of our programs and their benefits to others.
- Increase collaborations with other preeminent institutions around the world.
- Continue and expand our network of associations with industry locally in the San Joaquin Valley, the Bay Area, nationally, and internationally.
- Initiate and expand research efforts focused on global challenges related to the environment, sustainability, and security.
- Forward and seek nominations for our best faculty members into the national academies and designations as professional society fellows.

Research

- Focused areas (themes) for research synergy and growth are:
  - Sustainability and Human Health
  - Technologies for Biology and Health
  - Systems, Data, and Analytics
  - Management, Innovation, and Entrepreneurship
- Seek to establish centers/institutes that focus research in the theme areas, increasing research capabilities (expertise, facilities, equipment).

Graduate Education

- Seek and establish (non-state) financial resources that can be used to offer highly competitive financial packages to outstanding student recruits.
- Establish professional M.S. degree programs.
- Enhance recruitment efforts to increase the number of graduate student applicants.
- Work with the Graduate Division and Career Services to provide professional development programs for graduate students.

Undergraduate Education

- Decrease rate of enrollment growth in engineering majors with high student-to-faculty ratios.
- Seek to have all engineering majors accredited by ABET.

- Promote student success actively through enhanced support.
- Enhance the capstone design experience to better prepare graduates for professional practice.
- Expand the service learning program.
- Engage in outreach activities with high schools to promote STEM education and career opportunities.
- Incorporate professional development into the curriculum and work with Career Services to improve internship opportunities for undergraduate students at companies.

Administrative Services

- Work with the campus and SoE IT to improve information system efficiencies and streamline processes.
- Provide staff with training opportunities that will assist them in their job responsibilities and prepare them for career advancement.
- Improve internal communications, particularly between faculty and staff.
- Seek to add staff to support key administrative functions.

MILESTONE PROJECTIONS

A chart for tracking desirable milestones is presented in Figure 1 below.

	2016	2017	2018	2019	2020	2021	2022
USNWR Ranking	NR	----------	----------	----------	----------	----------	<100
Faculty Size	42	----------	----------	----------	----------	----------	75
UG Enrollment	1,698	----------	----------	----------	----------	----------	2,000
Graduate Enrollment	172	----------	----------	----------	----------	----------	375
Research Expenditures	$8.7M	----------	----------	----------	----------	----------	>$25M
Gift Funding	$0.3M	----------	----------	----------	----------	----------	>$2M
Summer/Other Revenue	$50K	----------	----------	----------	----------	----------	>$1M
PhD Degrees Awarded	13	----------	----------	----------	----------	----------	>35
MS Degrees Awarded	15	----------	----------	----------	----------	----------	>75
BS Degrees Awarded	190	----------	----------	----------	----------	----------	>300
NAE Faculty Member	0	----------	----------	----------	----------	----------	1
UG Programs	5	----------	----------	----------	----------	----------	6
Grad Programs* *CCGA Approved	2	----------	----------	----------	----------	----------	5
Project 2020 Bldgs		----------	----------	Lab 1	Lab 2	----------	
Management Program	SoE	MM MIST	PHD MIST	----------	----------	----------	GSoM

Figure 1. School of Engineering Chart for Tracking Milestone Targets

HISTORICAL DATA AND PERSPECTIVES

In developing this strategic plan, progress assessment will be critical to evaluating success (or lack thereof), and determining whether changes in the School's approaches and/or goals need correction. The following data will provide important baseline information to gauge progress towards our five-year aspirations.

Unfortunately, some key data were not available, reliable, or readily obtainable at present. The School is looking forward to rectifying this situation as we move forward and will update this section with additional data in future versions.

Enrollment

Enrollments in the SoE undergraduate and graduate programs over the past five years are summarized in Table 1.

Table 1. School of Engineering Program Enrollments

Fall Enrollments						
Program	2011	2012	2013	2014	2015	2016
BIOE	151	161	164	170	183	200
CSE	230	289	333	412	526	641
ENVE	98	106	177	110	108	103
MSE	36	39	41	32	40	41
ME	302	358	414	484	529	612
UD - ENGR	50	69	100	71	68	101
SOE UG	867	1022	1229	1279	1454	1698
BEST	20	24	22	23	22	23
EECS	25	28	34	37	41	58
ES	40	42	32	43	45	48
ME	14	22	24	27	35	43
SOE GRAD	99	116	112	130	143	172

Degrees Awarded

Degrees awarded through the SoE undergraduate and graduate programs over the past five years are summarized in Table 2.

Table 2. School of Engineering Degrees Awarded

Academic Year - Degrees Awarded						
Program	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
BIOE	4	22	23	30	17	27
CSE	16	27	35	43	36	54
ENVE	6	12	15	17	18	25
MSE	3	4	12	9	6	8
ME	27	35	53	64	74	81
BS - SOE	56	100	138	163	151	195
BEST	1	2	1	1	5	3
EECS	1	2	1	1	1	3
ES	3	3	6	3	5	3
ME	1	3	1	0	5	6
MS -SOE	6	10	9	5	16	15
BEST	0	2	4	5	2	2
EECS	1	1	6	4	3	5
ES	0	4	3	9	6	3
ME	1	1	2	0	2	2
PHD -SOE	2	8	15	18	13	12

Undergraduate Retention Rates

One-year, two-year, and three-year retention rates by freshman cohorts are summarized in Table 3.

Table 3. School of Engineering Undergraduate Retention Rates

One-Year Retention Rate by Freshman Cohort						
Program	Fall 2009	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014
BIOE	62%	67%	70%	59%	71%	79%
CSE	58%	65%	71%	73%	66%	78%
ENVE	59%	72%	70%	67%	58%	90%
MSE	50%	71%	71%	86%	83%	75%
ME	75%	75%	72%	77%	79%	69%
SOE	64%	70%	71%	72%	71%	76%
Two-Year Retention Rate by Freshman Cohort						
Program	Fall 2008	Fall 2009	Fall 2010	Fall 2011	Fall 2012	Fall 2013
BIOE	45%	53%	42%	53%	43%	62%
CSE	48%	32%	44%	47%	41%	50%
ENVE	29%	52%	44%	57%	40%	32%
MSE	44%	50%	57%	71%	71%	50%
ME	47%	48%	57%	61%	64%	63%
SOE	45%	45%	48%	55%	49%	54%
Three-Year Retention Rate by Freshman Cohort						
Program	Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011	Fall 2012
BIOE	21%	36%	50%	36%	36%	32%
CSE	21%	41%	26%	41%	40%	32%
ENVE	10%	29%	44%	33%	43%	40%
MSE		33%	50%	43%	29%	57%
ME	44%	36%	44%	54%	56%	57%
SOE	27%	37%	40%	44%	44%	42%

Undergraduate Graduation Rates

Four-year and six-year graduation rates by freshman cohorts are summarized for students entering and graduating in an engineering major in Table 4 and for students entering in an engineering major at UC Merced and graduating in any UC Merced major in Table 5.

Table 4. School of Engineering Undergraduate Graduation Rates within Engineering Majors

Four-Year Graduation Rate by Freshman Cohort						
Program	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011
BIOE	10%	0%	19%	21%	14%	15%
CSE	14%	8%	12%	15%	21%	22%
ENVE	20%	0%	12%	11%	17%	3%
MSE	0%		11%	0%	14%	0%
ME	4%	4%	9%	17%	20%	9%
SOE	10%	4%	13%	16%	19%	13%
Six-Year Graduation Rate by Freshman Cohort						
Program	Fall 2005	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Fall 2010
BIOE	42%	14%	21%	26%	50%	31%
CSE	17%	43%	18%	33%	23%	38%
ENVE	50%	40%	20%	18%	37%	39%
MSE		50%		22%	50%	29%
ME		31%	33%	34%	38%	43%
SOE	29%	32%	24%	30%	36%	38%

Table 5. School of Engineering Undergraduate Graduation Rates within UC Merced (any major)

Four-Year Graduation Rate by Freshman Cohort						
Program	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011
BIOE	24%	7%	29%	32%	31%	28%
CSE	21%	18%	18%	38%	37%	22%
ENVE	20%	10%	24%	22%	44%	20%
MSE	0%		11%	0%	14%	0%
ME	8%	7%	11%	27%	26%	15%
SOE	17%	12%	19%	30%	32%	23%
Six-Year Graduation Rate by Freshman Cohort						
Program	Fall 2005	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Fall 2010
BIOE	58%	38%	57%	50%	82%	64%
CSE	46%	61%	47%	65%	68%	65%
ENVE	100%	80%	60%	59%	63%	89%
MSE		50%		22%	50%	57%
ME		46%	56%	51%	60%	57%
SOE	53%	51%	53%	55%	67%	64%