Department of Computer and Electrical Engineering
and Computer Science
California State University, Bakersfield

Computer Engineering and Electrical Engineering SELF-STUDY AND PROGRAM PLAN

2016-2017

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Approved by the program faculty on April 19, 2018*
* Initial approval pending changes sent back to the subcommittee by majority faculty vote on April 6, 2018 with subcommittee report of changes given to department faculty on April 19, 2018

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Additional Supplemental Materials Available

The following supplementary materials are not included in this document due to their length. These materials are available electronically by request:

- ABET Self Study for Computer Engineering – July 2017
- ABET Self Study for Electrical Engineering – July 2017
- Computer Engineering degree proposal
- Electrical Engineering degree proposal
- Market Survey on Engineering Programs – March 2010

I. Self-Study

A. Introduction

The Computer Engineering and Electrical Engineering programs are housed in the Department of Computer and Electrical Engineering and Computer Science (CEE/CS) in the School of Natural Sciences, Mathematics, and Engineering (NSME). The Computer Engineering program began accepting students in Fall 2011 and contained two concentrations: Traditional Computer Engineering and Electrical Engineering. Effective Fall 2012, the Electrical Engineering concentration was elevated to its own degree program. The programs share significant resource overlaps in terms of faculty members, facilities, and student support services. The two programs are collectively referred to as the ECE programs.

During the development of the engineering programs at CSUB, a market survey was conducted to determine the engineering programs with the greatest demand in the area. The report, issued in March 2010, surveyed students from area high schools, BC, and CSUB about their interests and surveyed area employers about workforce needs. Of the responding students, 32% indicated an interest in Computer Engineering and 22% indicated an interest in Electrical Engineering. The employer survey indicated a strong interest in Electrical Engineering to support oil, gas, and alternative energy workforce needs.

This is the initial campus program review for both programs, and it has been timed to coincide with the initial ABET accreditation process for all three engineering programs. The department also houses the Computer Science program (the CMPS program), which will undergo Program Review in 2018/19.

ABET is the primary accreditation agency for engineering, computer science, and other technology programs. ABET accreditation is vital for engineering programs for the following reasons. Military agencies will only hire engineers that graduated from an ABET accredited engineering programs, and there are similar restrictions on military graduate school admissions and research programs. Other employers may restrict the higher-level pay scales to those who graduated from an ABET accredited program. Several states will not allow graduates to pursue licensing as a Professional Engineer (PE) if their program is not accredited. In California, graduates from a non-accredited program can still become a PE, but ABET accreditation reduces the time a graduate must work as a certified Engineering In Training (EIT) before they can sit for the PE license exam.

It is important to note that ABET accredits specific programs, not universities or courses. It is possible for a university to have one program that is ABET accredited and another program that is not ABET accredited, even if both programs have similar coursework. Part of the ABET accreditation process is to look at the curriculum and courses in the program, but it is only part of the process. We encourage UPRC members to peruse the ABET Self Studies for both ECE programs to understand the scope of the accreditation process. The ABET Site Visit occurred in November 2017. The final results of the accreditation effort will be publically released by ABET sometime in August or September 2018.

The mission of the ECE programs is expressed through the program education objectives (PEOs), as listed in Table 1. The PEOs reflect the broad, long-term objectives that graduates should obtain three to five years after graduation. The PEOs were developed in consultation with program constituents, including faculty members and industrial advisory board members. The PEOs also incorporate CSUB's and NSME's missions.

Table 1: Program Educational Objectives for ECE Students 3-5 Years after Graduation

PEO	Description
(2a)	Engage in the productive practice of electrical/computer engineering to identify and solve significant real world problems across a broad range of application areas.
(2b)	Ethically apply their electrical/computer engineering knowledge and skills with an understanding of realistic constraints for the overall benefit of a diverse society.
(2c)	Enhance the economic well-being of both Kern County and the State of California through a combination of technical expertise, social responsibility, leadership, and entrepreneurship.

(2d)	Effectively define, lead, and manage electrical/computer engineering projects to deliver timely results.

B. Response to and Changes since Previous Review

1. Response to Previous Review

As both Computer Engineering and Electrical Engineering are new programs, they have not yet had campus program reviews. However, the 2010/11 program review of the Computer Science program contained several recommendations that were directed towards not only the Computer Science program, but also the, at the time, pending Computer Engineering program. Our response to these recommendations is contained in Appendix E.

2. Other Relevant Changes

Since this is the first program review for both Computer Engineering and Electrical Engineering, there are no changes since the prior review to note.

C. Program's Role in Relationship to the University

1. Missions, Goals, and Objectives

The program educational objectives were developed in part to support the university's and school's mission statements. Engaging in the productive practice of engineering supports CSUB's mission to advance the intellectual and personal development of students and NSME's mission to prepare students for entry into the workforce and graduate programs. Ethically applying engineering knowledge for the benefit of society supports CSUB's commitment to diversity and global awareness and NSME's mission to promote STEM education to improve the human condition.

Enhancing the economic well-being of the region is in line with CSUB's mission to support the region's economic development and enhance its quality of life and NSME's mission to prepare students for leadership roles in the community. Effectively leading engineering projects also supports NSME's mission to prepare students for leadership roles. Table 2 gives the alignment of the PEOs to these portions of CSUB's and NSME's mission statements.

Table 2: Mapping of ECE Program Educational Objectives to CSUB and NSME Mission Statements

CSUB's Mission Statement	**PEO 2a**	**PEO 2b**	**PEO 2c**	**PEO 2d**
Advance the intellectual and personal development of its students	X			
Commitment to scholarship, diversity, service, global awareness and life-long learning		X		
Increase the region's overall educational attainment, enhance its quality of life, and support its economic development	X		X	
NSME's Mission Statement	**PEO 2a**	**PEO 2b**	**PEO 2c**	**PEO 2d**
Promote science, engineering, and health education for the purpose of improving the human condition.		X		
Foster scientific integrity in all professional endeavors.		X		
Prepare students for entry into the workforce in science, technology, engineering and mathematics (STEM), and healthcare services.	X			
Prepare students for admission to graduate programs in science, mathematics, engineering, and nursing.	X			
Prepare students for leadership roles in the community.			X	X

The PEOs reflect broad, long-term goals for graduates of the program while the student learning outcomes (SLOs) reflect the skills students obtain during the program. ABET Engineering Accreditation Commission (EAC)

has specific student outcomes required as part of Criterion 3, which are collectively referred to as the ABET EAC 3a through 3k student outcomes. The SLOs are given in Table 3.

Table 3: Student Learning Outcomes for ECE Students (based on ABET Criterion 3 for Engineering)

SLO	Description
3a	an ability to apply knowledge of mathematics, science, and engineering
3b	an ability to design and conduct experiments, as well as to analyze and interpret data
3c	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
3d	an ability to function on multidisciplinary teams
3e	an ability to identify, formulate, and solve engineering problems
3f	an understanding of professional and ethical responsibility
3g	an ability to communicate effectively
3h	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
3i	a recognition of the need for, and an ability to engage in life-long learning
3j	a knowledge of contemporary issues
3k	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

The SLOs support the eventual attainment of the PEOs as indicated in Table 4.

Table 4: Mapping of ECE Student Learning Outcomes to ECE Program Educational Objectives

Mapping of SLOs to PEOs	3a	3b	3c	3d	3e	3f	3g	3h	3i	3j	3k
2a. Productive engineering practice	X	X			X			X			
2b. Ethical application for diverse society			X			X				X	
2c. Enhance economy									X	X	X
2d. Project development and management			X	X			X				

The SLOs are the foundation of the assessment and continuous improvement plan, which is fully described in the ABET Self Studies in Criterion 4. A brief summary of Criterion 4 is provided in Section D of this document.

2. Relationship to University Learning Outcomes

The ABET/EAC SLOs map to the ULOs as indicated in Table 5.

Table 5: Mapping of ECE Student Learning Outcomes to CSUB's University Learning Outcomes

Mapping of SLOs to ULOs	3a	3b	3c	3d	3e	3f	3g	3h	3i	3j	3k
Goal I: Students will show critical reasoning and problem solving skills		X	X		X		X			X	X
Goal II: Students will be able to communicate orally and in writing							X			X	X
Goal III: Students will demonstrate discipline-based knowledge and career-based learning	X	X	X		X	X			X	X	X
Goal IV: Students will possess numerical literacy	X										
Goal V: Students will become engaged citizens				X	X	X		X	X		
Goal VI: Students will develop a well-rounded skill set		X	X	X	X	X		X		X	X

3. Relationship to Curriculum

The Computer Engineering and Electrical Engineering majors have to adhere to several requirements and constraints in the required curriculum. To support transfer pathways from California Community Colleges, the lower-division courses map to the Model Curriculum for Engineering, as outlined on C-ID.net. The majors are designed to have no more than 60 semester units of coursework after transfer with completion of the Model Curriculum and CSU GE breadth, and to have no more than 120 semester units of coursework overall. Both majors are also designed to meet the ABET general engineering criteria and the program-specific criteria for each respective program. The ABET requirements for curriculum are given in Table 6.

Table 6: ABET Curricular Requirements for Electrical Engineering and Computer Engineering Programs

ABET General Criteria (Criterion 5 - Curriculum) for Engineering Programs
The curriculum requirements specify subject areas appropriate to engineering but do not prescribe specific courses. The faculty must ensure that the program curriculum devotes adequate attention and time to each component, consistent with the outcomes and objectives of the program and institution. The professional component must include: (a) one year of a combination of college level mathematics and basic sciences (some with experimental experience) appropriate to the discipline. Basic sciences are defined as biological, chemical, and physical sciences. (b) one and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study. The engineering sciences have their roots in mathematics and basic sciences but carry knowledge further toward creative application. These studies provide a bridge between mathematics and basic sciences on the one hand and engineering practice on the other. Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet these stated needs. (c) a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives. Students must be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints. One year is the lesser of 32 semester hours (or equivalent) or one-fourth of the total credits required for graduation.
ABET Program Criteria for Electrical and Computer Engineering Programs
The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program. The curriculum must include probability and statistics, including applications appropriate to the program name; mathematics through differential and integral calculus; sciences (defined as biological, chemical, or physical science); and engineering topics (including computing science) necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components. The curriculum for programs containing the modifier "electrical," "electronic(s)," "communication(s)," or "telecommunication(s)" in the title must include advanced mathematics, such as differential equations, linear algebra, complex variables, and discrete mathematics. The curriculum for programs containing the modifier "computer" in the title must include discrete mathematics.

Since CSUB has only 120 total semester units, the definition of a year in the above table is 25% of the total units, or 30 semester units. This means there needs to be at least 25% math/science topics and at least 37.5% engineering topics to meet the ABET requirements. Additionally, courses are mapped to a category by topics in the course, not by prefix, so an ECE or CMPS course could be considered a math course if it primarily covers mathematics related to the discipline. A course can also split units between two categories. For example, ECE 1618 Introduction to Engineering I is counted as 1 unit of general education and 1 unit of engineering. Tables 5-1 and 5-2 in the ABET Self Studies give the specific mappings for each course.

The Computer Engineering curriculum has 29.44% math/science units and 43.89% engineering units under the 2013-15 catalog and has 26.67% math/science units and 48.33% engineering units under the 2016-18 catalog. The Electrical Engineering curriculum has 29.44% math/science units and 41.11% engineering units under the 2013-15 catalog and has 25.83% math/science units and 44.17% engineering units under the 2016-18 catalog. So both programs meet the ABET general criteria, with very little margin for error in math/science under the semester curriculum. Both programs also require courses which meet the ABET program criteria, such as MATH 340/3200 Probability Theory.

It should be noted that the 2011-13 catalog did not meet ABET requirements due to the high number of General Education and Other University Requirements courses in that catalog. **Since ABET will not accredit a program who has even one graduate under non-compliant curriculum, this issue with the 2011-13 catalog delayed our initial ABET accreditation by several years as students under the 2011-13 catalog either finished or voluntarily switched to the compliant 2013-15 or 2016-18 catalogs.**

As part of the quarter-to-semester transition, the department developed a comprehensive Q2S transition plan to keep students on-track for graduation while maintaining program quality. Lower-division sequences, such as three quarters of programming, were transformed into a two-semester sequence covering the same year-long sequence of topics. Most upper-division courses were transitioned to an equivalent semester course on a one-by-one basis, with the exception of the Signals and Systems sequence. For that sequence, the two quarter-system courses were converted to a single semester system course (ECE 3040).

During the Q2S transition, the department faculty members also closely looked at the prerequisite structure, and updated prerequisites to improve program quality. Departments offering cognate courses similarly developed Q2S transition plans and updated prerequisites for the cognate courses. Transition plans for both programs were provided to students and updated advising checklists for the 2013-15 catalog were provided that note the semester-equivalent courses to the 2013-15 degree requirements. These are available on the department website at https://www.cs.csub.edu/degree-info.php

The curriculum supports the attainment of the SLOs as shown in the following tables. Table 7 shows how the quarter-system courses support the attainment of SLOs and Table 8 shows the same for the semester-system courses. Both tables use the Introduced (I), Developed (D), Competent (C) scale used at CSUB for course alignment with student outcomes. Criterion 5 of the ABET Self Study also has the equivalent tables for the quarter-system curriculum of both programs.

Table 7: Mapping of Student Learning Outcomes to Quarter-System Courses

Computer Engineering Major Courses	3a	3b	3c	3d	3e	3f	3g	3h	3i	3j	3k
ECE/ENGR 1618 – Intro. to Engineering I				I		I	I	I			
ECE/ENGR 1628 – Intro. to Engineering II	I		I	I	I	I	I	I			I
ECE/ENGR 2070 – Electric Circuits	D	D		D							
CMPS 2010 – Programming I			I		I						I
CMPS 2020 – Programming II			D		I						I
CMPS 2120 – Discrete Structures	I										

CMPS 3240 – Comp. Arch. II: Organization	C		D		C					D	D
CMPS 3600 – Operating Systems			C								C
ECE 3040 – Signals and Systems	C	D			C						D
ECE 3070 – Analog Circuits	C	D			D					C	D
ECE 3200 – Digital Circuits		C					D				C
ECE 3220 – Digital Design with VHDL		D			C				D		D
ECE 3250 – Embedded Systems		C			C		D		D		C
ECE 4910 – Senior Project I	C	C	C	C	C	C	C	C	C	C	C
ECE 4928 – Senior Project II	C	C	C	C	C	C	C	C	C	C	C
MATH 2310/2510 & 2320/2520 – Calculus I&II	I										
MATH 2530 – Calculus III	D										
MATH 2610 – Linear Algebra I	D										
MATH 3200 – Probability Theory	D	D									
PHYS 2210 & 2220 – Physics I & II	I	I									
PHIL 3318 – Professional Ethics						D	D		D		

Table 8: Mapping of Student Learning Outcomes to Semester-System Courses

Electrical Engineering Major Courses	**3a**	**3b**	**3c**	**3d**	**3e**	**3f**	**3g**	**3h**	**3i**	**3j**	**3k**
ECE/ENGR 1618 – Intro. to Engineering I				I		I	I	I			
ECE/ENGR 1628 – Intro. to Engineering II	I		I	I	I	I	I	I			I
ECE/ENGR 2070 – Electric Circuits	D	D		D							
CMPS 2010 – Programming I			I		I						I
ECE 3040 – Signals and Systems	C	D			C						D
ECE 3070 – Analog Circuits	C	D			D					C	D
ECE 3200 – Digital Circuits		C					D				C
ECE 3230 – Digital Communication					C						C
ECE 3320 – Fields and Waves					C						
ECE 3340 – Control Systems		C									
ECE 3370 – Power System Fundamentals	C										
ECE 4910 – Senior Project I	C	C	C	C	C	C	C	C	C	C	C
ECE 4928 – Senior Project II	C	C	C	C	C	C	C	C	C	C	C
MATH 2310/2510 & 2320/2520 – Calculus I&II	I										
MATH 2530 – Calculus III	D										
MATH 2610 – Linear Algebra I	D										
MATH 3200 – Probability Theory	D	D									
CHEM 1000 – General Chemistry	I										
PHYS 2210 & 2220 – Physics I & II	I	I									
PHIL 3318 – Professional Ethics						D	D		D		

4. Other Relationships

Under the quarter-system catalog, there were no General Education courses, university-wide requirements, service courses, certificate programs, interdisciplinary programs, or minors offered under the ECE prefix.

Under the semester-system catalog, there are three major/GE courses offered: ECE/ENGR 1618 Introduction to Engineering I (First Year Seminar I), ECE/ENGR 1628 Introduction to Engineering II (First Year Seminar II), and ECE 4928 Senior Project II (Capstone). While ECE/ENGR 1618 and 1628 are open to any major, these courses are primarily taken by engineering majors. Therefore, these courses have minimal impact outside the two engineering departments. ECE 4928 is only available for Electrical and Computer Engineering majors, so it has no impact outside of the ECE programs.

D. Evidence of Program Quality

1. Student Learning Outcomes and Program Assessment

a. Program Quality

The process for assessing attainment of student learning outcomes is foundational to the continuous cycle of improvement of the ECE programs. The core of this cycle is measurement of SLOs using a variety of assessment tools, regular analysis and evaluation of the results of these measurements by program faculty members in order to respond to the feedback provided, and development and implementation of improvement action plans based on the analysis and evaluation.

Effective assessment begins with actionable data about student performance. The department has developed a two-year assessment cycle to measure each SLO in the upper-division core classes for the program. SLOs are only assessed in courses where the students should be proficient at the skills reflected in the SLO (e.g. "Competent" on the IDC scale). However, to prevent undue assessment burden on faculty, each course only assesses a handful of SLOs, even if students are expected to be proficient in more SLOs. The assessment schedules are posted on https://www.cs.csub.edu/abet/abet_plan.html

Faculty members can choose from the following tools to measure attainment of each SLO in their courses:

a) 4-point rubric (4=exemplary, 3=proficient, 2=apprentice, 1=novice) where the rubric for each SLO has been developed and approved by the department during an assessment meeting. Rubrics are posted on https://www.cs.csub.edu/abet/abet_plan.html
b) Direct score on an assignment or exam problem.

An assessment report is filed for each course which lists the SLOs assessed during the term. If the course contains students from multiple majors, a report is filed for each major listing the attainment for that specific major. A combined report is also allowed, as long as each major and the associated attainment for that major is clearly identified in the report. The course assessment report uses a 4-point scale, Exceeded (E), Met (M), Conditionally Met (CM), and Failed to Meet (F), to rate the attainment of each SLO for each measurement by students in the specified major.

The course assessment report summarizes the method(s) used to measure the SLO(s) for the course, the detailed outcome(s) for the students in the specified major (including the number of students in that major), the rating scale used by the instructor to assign E/M/CM/F ratings, and any comments the instructor wishes to leave about the course and/or potential future actions if the students were not performing at the expected level. Beginning in the Fall 2015 term, the criteria for the "Met" condition has been standardized to the following: at least 70% of the students are at the "Proficient" level or higher (for the courses that use rubrics) or have scored a 70% or higher (for courses that use direct scores). Prior to Fall 2015, most courses also used this criteria for "Met", with the exception of ECE 423 Digital Communications, which used a threshold of 60% of the students for the "Met" condition.

To determine the overall level of achievement for each of the 3a through 3k student outcomes, the E/M/CM/F rating for each SLO is converted to a numeric value, where 4="Exceeded", 3="Met", 2="Conditionally Met", and 1="Failed". The expected level of attainment for the course E/M/CM/F rating is that at least 70% of the courses "Exceeded" or "Met" expectations, which is an average score of 3.0 on the numeric scale.

Additionally, since the course assessment reports contain the number of CE and EE students in the course and the percentage of CE and EE students who have met or exceeded the expectations, the percentage of CE and EE students that are proficient in the outcome is calculated. At least 70% of the students are expected to be proficient in each outcome.

Both metrics are analyzed during department meetings to determine an overall ranking on the E/M/CM/F scale for each SLO. Conducting both modes of analysis guards against a small class skewing the average results for the E/M/CM/F scale.

Indirect measures of SLOs are from senior exit surveys and the Fundamentals of Engineering (FE) Exam. Exit surveys are administered to students in the second course of the Senior Project sequence (ECE 4928). The exit survey asks students to rate how well they feel the program prepared them in each of the 3a through 3k SLOs. This rating is on a 4-point scale: Well Prepared, Prepared, Neutral, Not Prepared. For the senior exit survey, the expected level of attainment for each student outcome is at least 70% of the students have answered that they are "Prepared" or "Well Prepared" in the outcome.

The department treats the Fundamentals of Engineering Exam for Electrical and Computer Engineering (FE Exam for ECE) as an indirect measure because we do not require the completion of the FE Exam as a portion of the Senior Project course sequence. We do not require this exam as part of Senior Project because students must travel over 60 miles to the nearest Pearson testing center to take the exam, the exam is an all-day exam, and the exam costs $225. This makes it difficult for some of our students to take the FE Exam. To date, no Computer Engineering students and only five Electrical Engineering students have taken the FE Exam. The expected level of attainment for the FE Exam is a 0.0 scaled score or higher, as a 0.0 scaled score reflects performance at the national average.

All assessed ECE courses are face-to-face courses, so there is no need to disaggregate the data by mode of delivery. As noted above, data is disaggregated by major, so attainment of Computer Engineering students is measured separately from that of Electrical Engineering students. Assessment results in the next section reflect data collected from 2013/14 through 2016/17 (four years). Earlier assessment reports, when faculty were still learning about course-level assessment, did not clearly disaggregate results by major, so they were not included in this analysis.

Computer Engineering Assessment Results

The Computer Engineering assessment results are as follows. For the direct course measures, outcomes were analyzed at an individual course level (Figure 1) and for the student population across all courses for each student learning outcome (Figure 2).

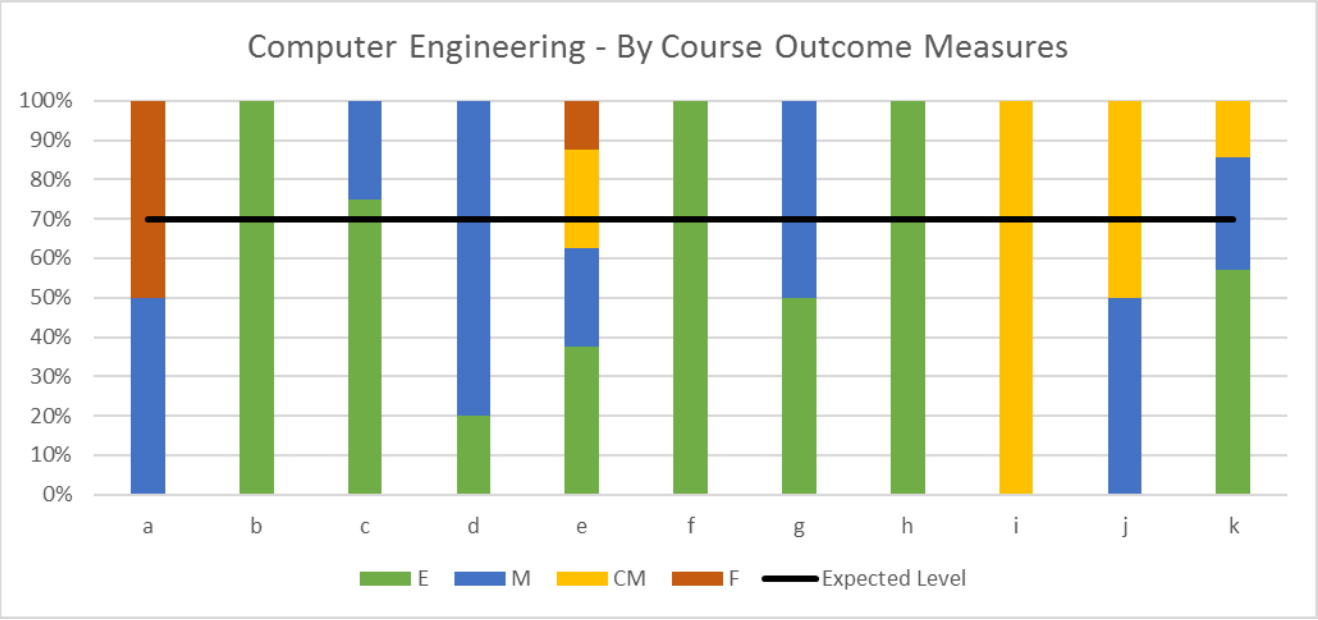

Figure 1: Computer Engineering Assessment by Course Outcome Measures

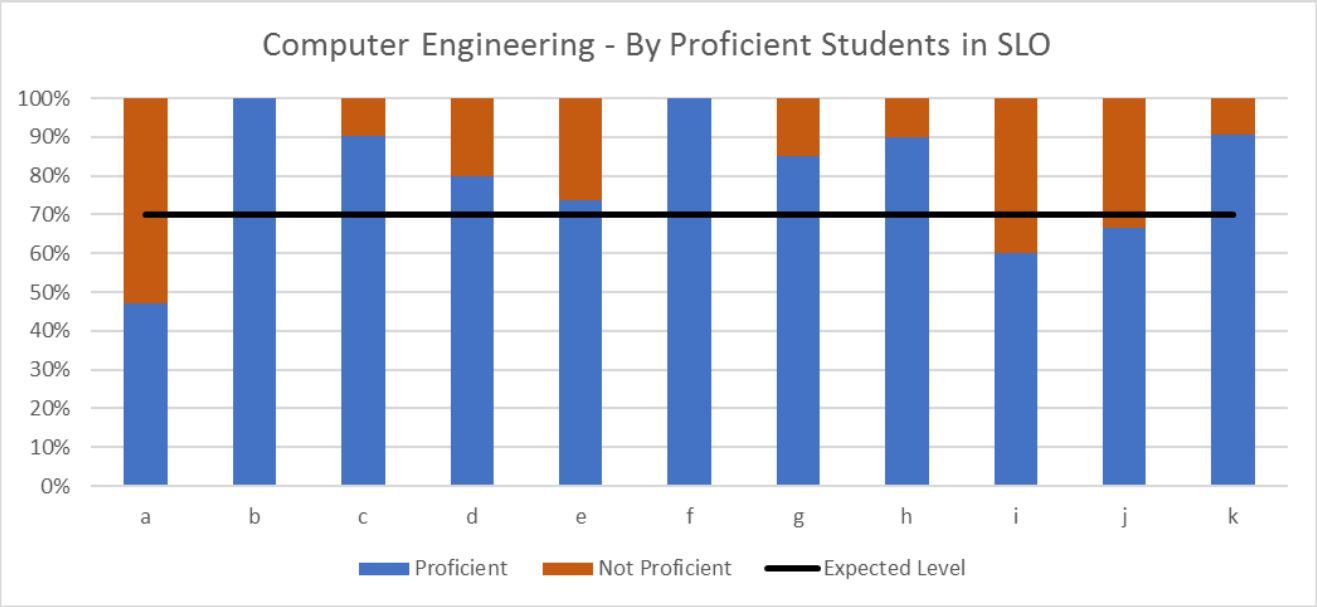

Figure 2: Computer Engineering Assessment by Percentage of Students who are Proficient

The Computer Engineering senior exit survey results for the ten CE students who completed the survey in the Spring 2017 term are given in Figure 3.

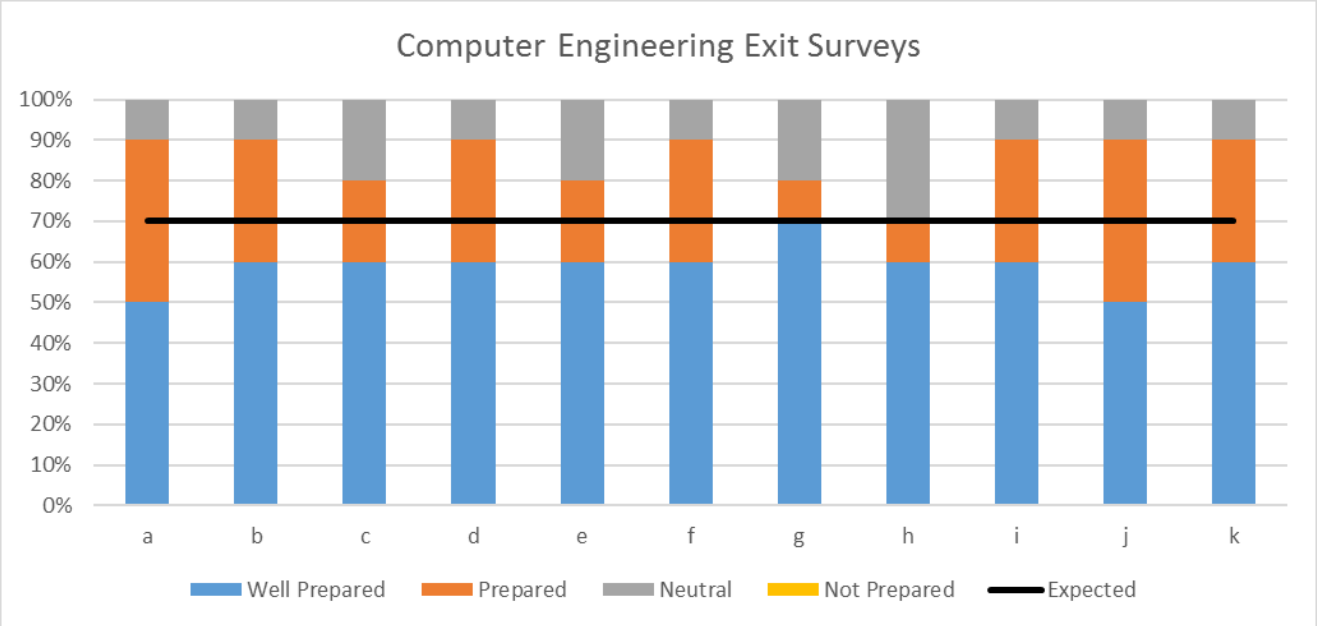

Figure 3: Computer Engineering Exit Survey for Spring 2017

As noted above, no Computer Engineering students took the FE Exam. Table 9 gives a summary of the attainment of SLOs for Computer Engineering students. More weight was placed on the course-level direct measures than on the exit survey (indirect measures) when the department determined the overall results.

Table 9: Overall Assessment Results for the Computer Engineering Program

	3a	3b	3c	3d	3e	3f	3g	3h	3i	3j	3k
Direct Measures	F	E	E	M	CM	E	M	E	CM	CM	M
Exit Survey	E	E	M	E	M	E	M	M	E	E	E
Overall Result	F	E	M	M	CM	E	M	M	CM	CM	M

Course-level assessment methods noted deficiencies in outcome (3a) “An ability to apply knowledge of mathematics, science, and engineering” and potential issues with the outcomes (3e) “An ability to identify, formulate, and solve engineering problems”, (3i) ”A recognition of the need for, and an ability to engage in life-long learning”, and (3j) “A knowledge of contemporary issues”. Discussions of these issues and their associated action plans are in Table 12: Action Plan and Continuous Improvement for Computer Engineering.

Electrical Engineering Assessment Results

The Electrical Engineering assessment results are as follows. For the direct course measures, outcomes were again analyzed at an individual course level (Figure 4) and for the student population across all courses for each student learning outcome (Figure 5).

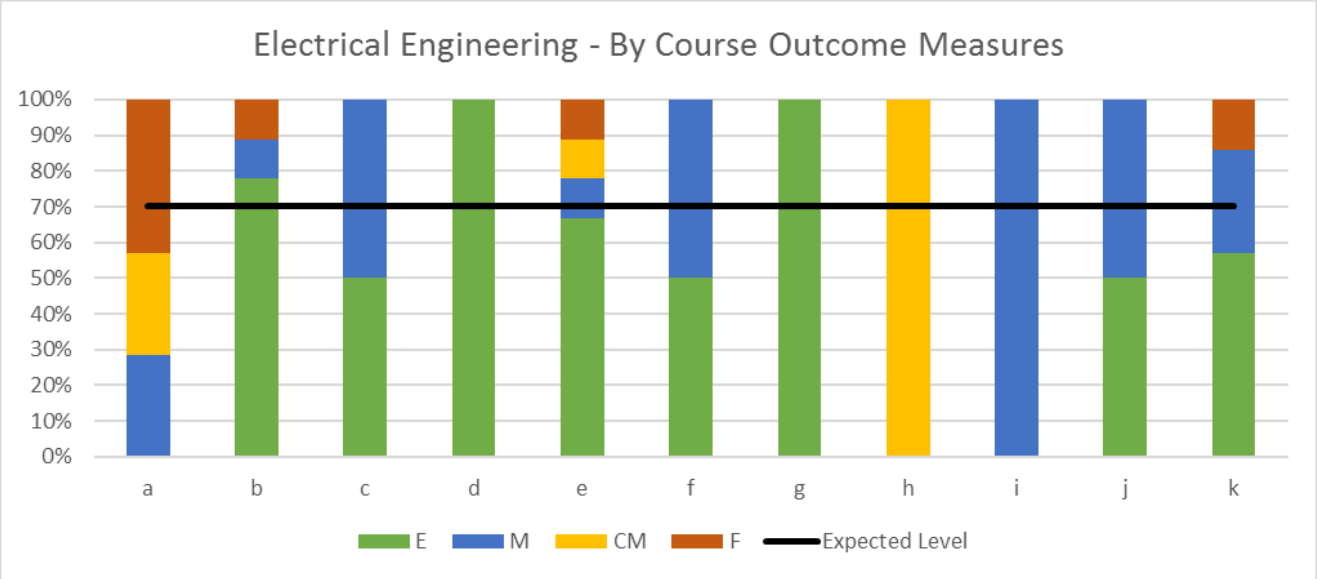

Figure 4: Electrical Engineering Assessment by Course Outcome Measures

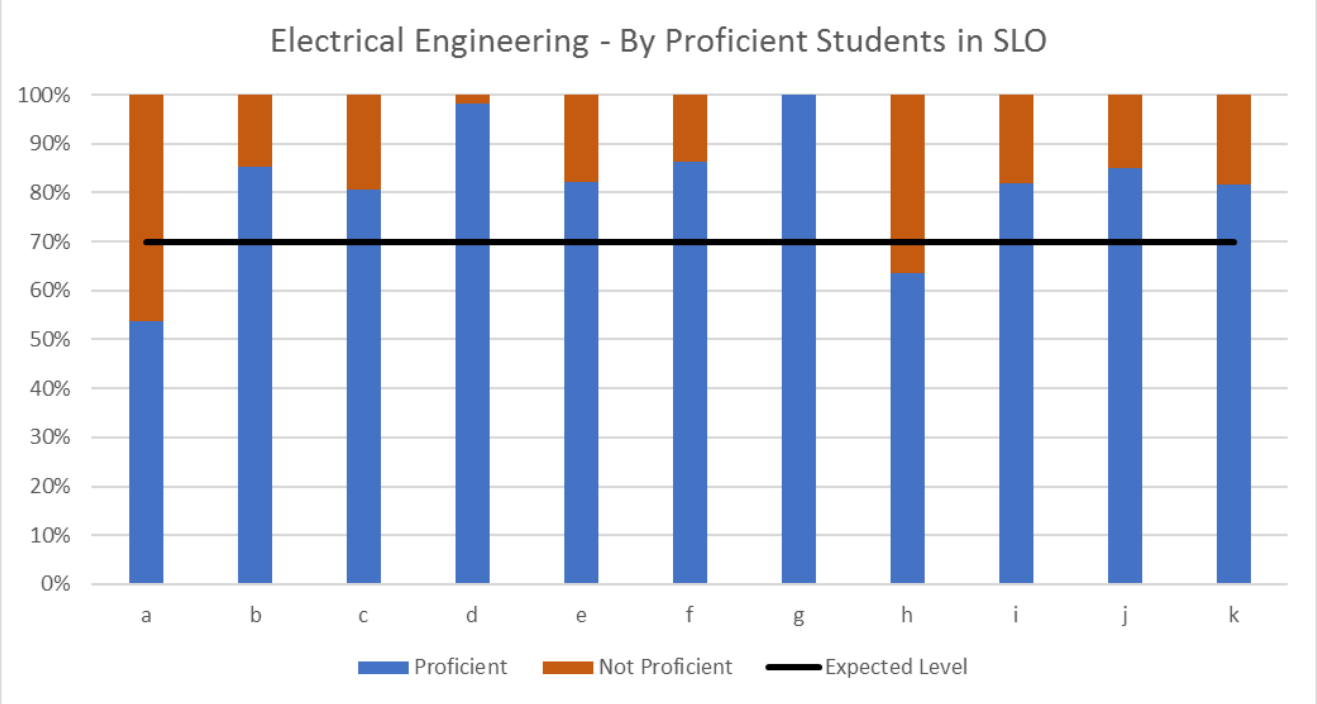

Figure 5: Electrical Engineering Assessment by Percentage of Students who are Proficient

The results for the three EE students who took the FE Exam in Fall 2016 are given in Table 10.

Table 10: Electrical Engineering Assessment Results from FE Exam in Fall 2016

Mapped SLO	Number of FE Areas	E	M	CM	F	Average Ranking	% of FE Areas at E or M	Average Scaled Score
3a	8	4	2	2	0	3.25	75.00%	0.32
3c	1	0	1	0	0	3	100.00%	0.21
3e	1	0	0	1	0	2	0.00%	-0.14
3f	1	0	0	0	1	1	0.00%	-0.45
3k	4	1	1	1	1	2.5	50.00%	-0.01

The Electrical Engineering senior exit survey results for the nine EE students who completed the survey in the Spring 2017 term are given in Figure 6.

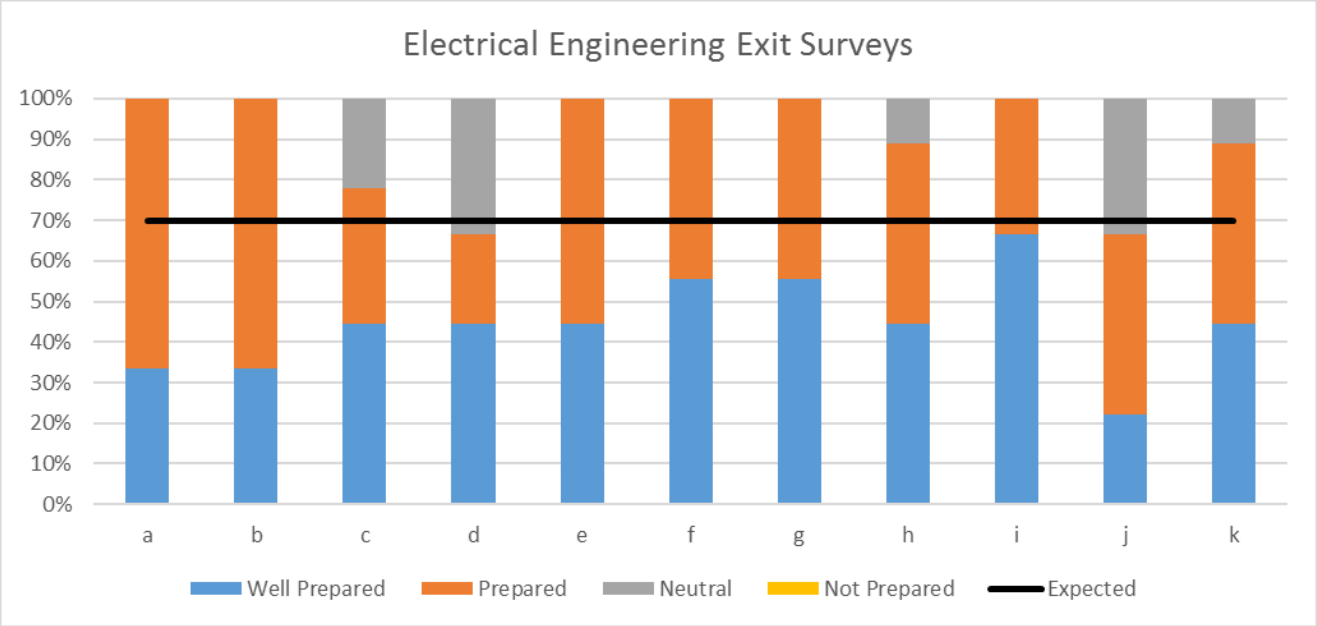

Figure 6: Electrical Engineering Exit Survey for Spring 2017

Table 11 gives a summary of the attainment of SLOs for Electrical Engineering students. More weight was placed on the course-level direct measures than the indirect measures (exit survey and FE Exam) when the department determined the overall results. Within the indirect measures, the FE Exam was weighted more than the exit surveys since they are nationally normed (but with a small sample size).

Table 11: Overall Assessment Results for the Electrical Engineering Program

	3a	3b	3c	3d	3e	3f	3g	3h	3i	3j	3k
Direct Measures	F	M	M	E	M	M	E	CM	M	M	M
Exit Survey	E	E	M	CM	E	E	E	M	E	CM	M
FE Exam	M		M		CM	F					CM
Overall Result	F	M	M	M	M	M	E	CM	M	M	M

Course-level assessment methods noted deficiencies in outcome (3a) “An ability to apply knowledge of mathematics, science, and engineering” and potential issues with outcome (3h) “The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and

societal context". For the FE Exam, deficiencies were noted in outcome (3f) "An understanding of professional and ethical responsibility" and potential issues were noted in outcomes (3e) "An ability to identify, formulate, and solve engineering problems" and (3k) "An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice". Discussions of these issues and their associated action plans are in Table 13: Action Plan and Continuous Improvement for Electrical Engineering.

b. Changes Made as Result of Assessment

The department meets at least once annually to review course assessment reports, indirect assessment data, and instructor-suggested action plans. Additional meetings may be held throughout the academic year to discuss assessment results, to modify assessment schedules, or to discuss action plans. In the 2016/17 academic year, the regular assessment meeting was held during University Week before Fall semester began. Two additional assessment meetings were held at the end of Spring 2017 semester to review the new data that had been collected during the academic year.

During department discussions of assessment reports from the 2013/14 academic year, there was a strong concern expressed by faculty members about the prerequisite structure for the ECE courses for both CE and EE students. We were also in the process of designing the semester curriculum at that time, so faculty members used the assessment results to inform the selection of prerequisite courses under semesters. This resulted in many prerequisite changes to ECE courses under the semester system. In particular, the lower-division Electric Circuits course, ECE/ENGR/PHYS 2070 (previously ENGR/PHYS 207), and the upper-division Signals and Systems course, ECE 3040 (previously ECE 304 and 330) were added as prerequisites to many core courses. Several prerequisite changes were also made to quarter system courses where the prerequisites at the time were inadequate and the change could not wait until the semester conversion in Fall 2016.

Additionally, under the quarter system, ECE 320 Digital Circuits was a shared course between computer engineering, electrical engineering, and computer science students. Since the computer science students do not take Electric Circuits, it was not a prerequisite for Digital Circuits for the quarter system. Under semesters, computer science students are no longer required to take ECE 3200 Digital Circuits, so the prerequisites were updated to require Electric Circuits. We expect that this will greatly improve the preparation of students in the ECE 3200 course, and therefore their outcomes. Since ECE 3200 is the prerequisite to ECE 3220, this change should also improve the outcomes in ECE 3220 over time, as the students who take the improved version of ECE 3200 move on to ECE 3220.

Table 12: Action Plan and Continuous Improvement for Computer Engineering

SLO	Issue Noted	When	Action Plan	Timeline / Results
Cycle 1 Continuous Improvement (2013/14 and 2014/15 Academic Years)				
All	Instructors were having difficulty with the complexity of the assessment schedule.	Cycle 1 assessment.	Develop a new assessment schedule that simplifies the assessment requirements for each course while still assessing all performance indicators over a two-year assessment cycle.	New assessment schedule was developed over the course of multiple meetings in 2014/15 academic year. New schedule was implemented in 2015/16.
All	Prerequisites of several courses did not adequately reflect needed skills for the course.	2013/14 assessment.	Revise prerequisites for quarter courses that cannot wait for semester conversion. Review semester prerequisites.	Winter and Spring 2015 – Prerequisite changes approved by department and NSME Curriculum Committee.
3k	Computer engineering students in CMPS 360 Operating Systems were only 66.7% proficient in assessed project. More than half of the students did not complete later phases of project.	2013/14 assessment. Action Plan reviewed again at Fall 2016 assessment meeting	Instructor planned to change nature of project so more students complete all sections of project. Instructor went on medical leave and course was then taught by part-time faculty. This was not reevaluated until a new full-time faculty member took over the course in 2016/17.	Student completion rates with new instructor are much greater than 50%. Two other courses assessed in PI k2, one in 2014/15 and one in 2016/17. Computer engineering students met expectations in both courses.
3j	Students in CMPS 321 Computer Architecture were only 64% proficient. Instructor noted this performance indicator was difficult to assess for the course.	2014/15 assessment. Action Plan reviewed again at Fall 2016 meeting.	Beginning in 2015/16, assessment of the outcome was moved to ECE 490A / 4910 Senior Project I due to the difficulty of assessing it in CMPS 321. PI scheduled to be measured in Fall 2016.	In Fall 2016, 70% of the students met this outcome. This was discussed at the Spring 2017 assessment meeting and the decision was to monitor the situation in Fall 2017 to see if this is an actual issue.
Cycle 2 Continuous Improvement (2015/16 and 2016/17 Academic Years)				
All	Review implementation of new assessment schedule and revise schedule for semester courses.	2015/16 and Fall 2016 assessment meetings	Schedule updated for semester courses. Additional training for new faculty members. Goal: More compliance with the new assessment schedule under semesters in 2016/17.	All scheduled assessment reports for 2016/17 were submitted and all reports were viable.
3a	Students only met expectations for 2 out of the 4 courses where this was measured and only 47% of the students were proficient overall.	Spring 2017 assessment meeting	Concerns expressed during discussion related to performance in prerequisite courses and knowledge retention between terms. Percent of students scoring a “C- or better” in calculus and physics is within expectations from campus Tableau visualizations, so this is unlikely to be due to easy grading at the lower-division level. Action plans are:	2017/18 Academic Year (not yet implemented) Notes for implementation: • Spring 2018 is the earliest prerequisite changes can go into effect with current course change approval cycles, so Fall 2017 classes will still have default passing grade

			• Put a "C- or better" grade requirement on Electric Circuits prerequisite course (campus default is "D- or better", which is considered passing) • Discuss similar grade requirement for Calculus II during first Fall 2017 general department meeting • Assess prerequisite knowledge retention through quizzes administered at start of course	• Department faculty will develop prerequisite knowledge quizzes by working with the faculty teaching the prerequisite courses • Faculty members in selected core courses will administer the prerequisite knowledge quizzes • Data will be analyzed at the 2017/18 assessment meeting
3e	Students met expectations in 5 of the 8 measured courses. Overall, 74% were proficient. Most issues observed in ECE 3220 Digital Design with VHDL in Spring 2017, where only 29% of the students were proficient.	Spring 2017 assessment meeting	VHDL has ECE 320 / 3200 Digital Circuits as a prerequisite, but that course was less stringent under quarters (as described above). Issue in VHDL might be due to a large number of students having taken the quarter version of Digital Circuits. Action Plan: • Separate measurements into students who took ECE 320 (quarters) vs ECE 3200 (semesters) and see if results differ between two groups	2017/18 Academic Year (not yet implemented)
3i	ECE 4910 in Fall 2016 was only measure for this outcome and computer engineering students were only 60% proficient in that course. Students struggled with conducting literature reviews.	Spring 2017 assessment meeting	Instructor for ECE 4910 in Fall 2017 plans to conduct a tutorial on literature reviews and to invite the engineering subject-area librarian to give a presentation on library resources. We will reassess the outcome after this term.	Fall 2017 (not yet implemented)
3j	Students met expectations in ECE 4910, but failed to meet expectations in CMPS 321 (discussed above).	Spring 2017 assessment meeting	Monitor the attainment of this outcome in future sections of ECE 4910 and see if students continue to meet expectations or not.	Fall 2017 (continue to monitor from Fall 2016)

Table 13: Action Plan and Continuous Improvement for Electrical Engineering

SLO	Issue Noted	When	Action Plan	Timeline / Results
Cycle 1 Continuous Improvement (2013/14 and 2014/15 Academic Years)				
All	Instructors were having difficulty with the complexity of the assessment schedule.	Cycle 1 assessment.	Develop a new assessment schedule that simplifies the assessment requirements for each course while still assessing all performance indicators over a two-year assessment cycle.	New assessment schedule was developed over the course of multiple meetings in 2014/15 academic year. New schedule was implemented in 2015/16.
All	Prerequisites of several courses did not adequately reflect needed skills for the course.	2013/14 assessment.	Revise prerequisites for quarter courses that cannot wait for semester conversion. Review semester prerequisites.	Winter and Spring 2015 – Prerequisite changes approved by department and NSME Curriculum Committee.
3c	Students conditionally met expectations in ECE 423 Digital Communication	2013/14 assessment. Revisited 2014/15.	Instructor planned to solve more problems in lecture for next course offering	Winter 2015 – Reassessment showed students exceeded expectations with additional problem solving
3c	Students met expectations but had difficulty with per-unit systems and analysis of power systems with three-phase transformers in ECE 337 Power Systems	2013/14 assessment. Revisited 2014/15.	Instructor planned to offer more help and practice in these areas for next course offering	Winter 2015 – Student performance improved from 78% proficient to 85% proficient
Cycle 2 Continuous Improvement (2015/16 and 2016/17 Academic Years)				
All	Review implementation of new assessment schedule and revise schedule for semester courses.	2015/16 and Fall 2016 assessment meetings	Schedule updated for semester courses. Additional training for new faculty members. Goal: More compliance with the new assessment schedule under semesters in 2016/17.	All scheduled assessment reports for 2016/17 were submitted and all reports were viable.
3b	Only 45% of students were proficient in this area for ECE 330 Signals and Systems II	Winter 2016 (discussed at Fall 2016 meeting)	This course is one of the first courses students take at the upper-division level after completing calculus and physics cognates. The course may be too soon in the curriculum for proficiency in this performance indicator. Students in later courses were assessed during 2016/17 to see if there is actually a proficiency issue	Fall 2016 for ECE 3200 and Spring 2017 for ECE 3230 – 100% of the ECE 3200 students and 77% of the ECE 3230 students were proficient in this performance indicator, which meets expectations. Moved assessment of this indicator to ECE 3340 Control Theory beginning in 2017/18.
3a	Students only met expectations for 2 out of the 7 courses where this was measured and only 54%	Spring 2017 assessment meeting	Concerns expressed during discussion related to performance in prerequisite courses and knowledge retention between terms. Percent	2017/18 Academic Year (not yet implemented)

	of the students were proficient overall. Outcomes for FE exam met expectations, but sample size is small and biased towards the students who will travel 60+ miles to take the FE exam.		of students scoring a "C- or better" in calculus and physics is within expectations from campus Tableau visualizations, so this is unlikely to be due to easy grading at the lower-division level. Action plans are: • Put a "C- or better" grade requirement on Electric Circuits prerequisite course (campus default is "D- or better", which is considered passing) • Discuss similar grade requirement for Calculus II during first Fall 2017 general department meeting • Assess prerequisite knowledge retention through quizzes administered at start of course	Notes for implementation: • Spring 2018 is the earliest prerequisite changes can go into effect with current course change approval cycles, so Fall 2017 classes will still have default passing grade • Department faculty will develop prerequisite knowledge quizzes by working with the faculty members teaching the prerequisite courses • Faculty members in selected core courses will administer the prerequisite knowledge quizzes • Data will be analyzed at the 2017/18 assessment meeting
3d	Course-level assessment met expectations, but only 67% of the students on the exit survey felt prepared for multidisciplinary teamwork.	Spring 2017 assessment meeting	Since the sample size for the exit survey was low and the results were very close to the 70% expected level, faculty will monitor this situation and reassess at the 2017/18 assessment meeting.	2017/18 Academic Year (not yet implemented)
3e	FE exam results for "Circuit Analysis" were below expectations. Course-level assessments met expectations.	Spring 2017 assessment meeting	Only three students took the FE exam, so this may be due to the small sample size. Faculty will monitor this situation and reassess at the 2017/18 meeting.	2017/18 Academic Year (not yet implemented)
3f	The course-level assessment for ECE 4910 Senior Project I were barely above the proficiency threshold. The FE exam results were below expectations.	Spring 2017 assessment meeting	Since there are only two course-level assessment measures and only three students took the FE exam, we will monitor this situation closely during the Fall 2017 ECE 4910 course. If the trend continues to hold, additional actions will be taken.	Fall 2017 (not yet implemented)
3h	Students in ECE 4910 were slightly below expectations for this outcome.	Spring 2017 assessment meeting	Instructor noted that students seemed to be confused about what they were supposed to do to evaluate the impacts of their project. We plan to more clearly define what we are asking for in this portion of the project proposal for the Fall 2017 ECE 4910 course and see if this improves the student attainment.	Fall 2017 (not yet implemented)
3j	Students barely met expectations	Spring 2017	Since there are only two course-level	2017/18 Academic Year (not yet

	in ECE 4910 in Fall 2017. Exit survey results were slightly below expectations as well.	assessment meeting	assessment measures and students were proficient in the second course, it is unclear if this is a trend or just an issue with the students in senior design project in 2016/17. We will wait for more assessment data and reassess at the 2017/18 meeting.	implemented)
3k	6 of the 7 course-level assessment reports said students met expectations. There were mixed results for the FE exam, particularly in “Power” and “Digital Systems”.	Spring 2017 assessment meeting	In ECE 3230, the course were expectations were not met, students had difficulty with MATLAB modeling and did not have good matrix manipulation skills. Discussions centered on when MATLAB is taught in the curriculum and the prerequisites for the course. Action plans: • Instructor will have additional tutorials on MATLAB modeling, since prerequisite courses may not cover as much MATLAB modeling as the course requires • Faculty will discuss adding MATH 2610 Linear Algebra as a prerequisite to the course during next general department meeting	2017/18 Academic Year (not yet implemented)

c. Student Placement

ECE graduates have gone on to careers in industry, careers in government, and to graduate programs across the country. There is no formal mechanism to track students at the department level after graduation, so data is collected as students update faculty members informally. Even given this severe restriction, the department has numerous data points as to the placement of its graduates, as shown in Figure 7.

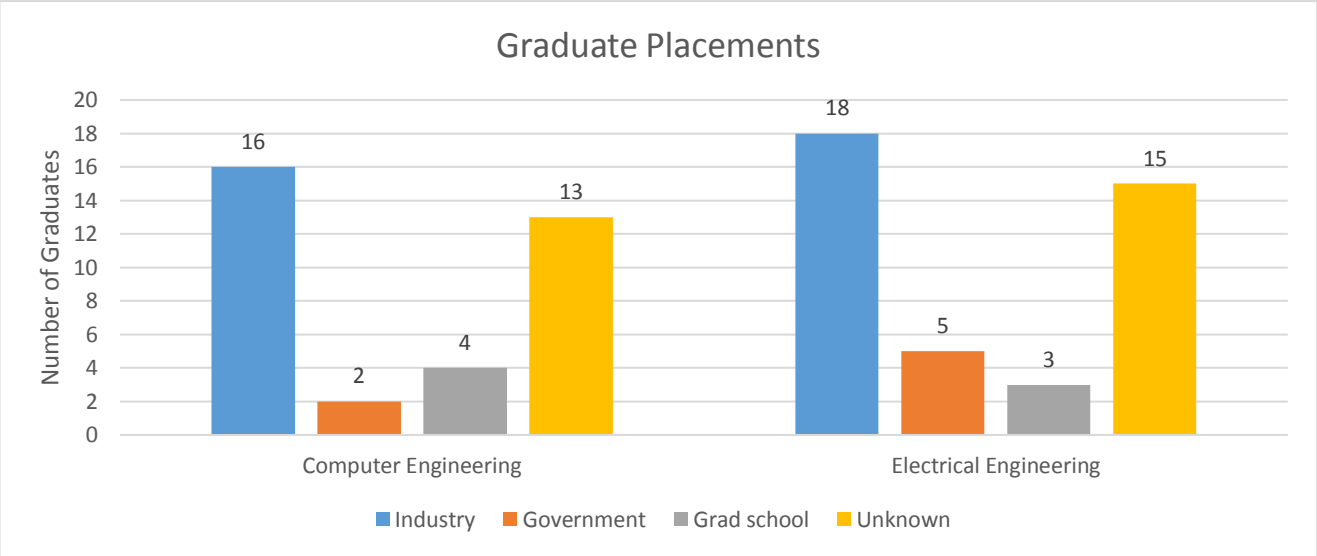

Figure 7: Placement of ECE Graduates into Industry, Government, and Graduate School

Due to the length of this data, specific details about placements for Computer Engineering graduates and Electrical Engineering graduates are listed in Appendix G.

d. Student Scholarship and Creative Activities

While our programs are new, the ECE faculty have extensively involved undergraduate students in their research activities and in the formation of new research laboratories. Our ECE students have been active in publishing their research at local, national, and international conferences, as well as participating in student-based venues such as the CSUB Student Research Competition and student conferences. The following are just some highlights of undergraduate student research accomplishments:

- David Oswald, CE Spring 2013, has conducted research in robotics and sensor networks, particularly with relation to computer vision and chemical plume tracing. He has continued to collaborate with his CSUB faculty advisor, Dr. Wei Li, after going on to graduate school and they have co-authored several publications.
- Geromar Hasta, EE Spring 2016, and Kody Bryan, CE Spring 2017, conducted research in facial emotion recognition using video data. This work was published in Motor Trend Magazine in 2015. Geromar was also a Student Research Scholar in 2015.
- Sheriff Sadiqbatcha, CE Spring 2016, published his research on solving fuzzy linear systems of equations, with applications in controlling energy systems, at several peer-reviewed venues. He won first place in the Technology and Engineering poster session at the 2016 Emerging Researchers National (ERN) Conference. Most notably, he won best student paper at the international IEEE World Congress on Computational Intelligence, competing against the work of Ph.D. and Master's students. He was selected as the Outstanding Graduating Senior for Computer Engineering for the 2015/16 academic year due to his prestigious research record.
- Jenny Villatoro, EE Spring 2016, published her research on using sensors to measure biomarkers in exhaled breath samples to determine cholesterol levels in the International Conference on Biomedical Engineering and Sciences during the 2015/16 academic year. She is now in graduate school continuing on this work.

- Korey Cain, EE Fall 2016, conducted research on wireless communication algorithms for 5G mobile communications. He submitted his research to a peer-reviewed conference and won second place in the Computer Science and Engineering category of the 2016 CSUB Student Research Competition. He was selected as the Outstanding Graduating Senior for Electrical Engineering for 2016/17.

e. Other Evidence

Alumni and employers in the area are members of the Industrial Advisory Board (IAB). The IAB is shared between both engineering departments at CSUB. As stated in the IAB by-laws, "[t]he purpose of the IAB is to advise, support, and promote the Electrical Engineering, Engineering Sciences, Computer Engineering, and Computer Science programs (ECS programs) at CSUB. A primary function is to facilitate the continuous improvement of the quality and scope of the programs by keeping the programs current and relevant."

One method that the IAB uses to help improve the programs and keep them current is to provide feedback on curriculum. In addition to providing feedback on curriculum, the IAB provides important feedback on the program educational objectives and how well they represent the skills and attributes needed to be a successful engineer in various employment sectors. A wide range of key employment sectors for Kern County are represented on the board.

IAB meetings are held on-campus during the academic year. When the IAB was first formed, it met on a monthly basis on the third Thursday of the month, with no meetings occurring during the summer and winter breaks. During the 2016/17 academic year, meeting frequency was reduced to twice a semester. The secretary of the IAB is responsible for notifying board members of upcoming meetings, meeting agendas, and maintaining meeting minutes. The chair of the IAB presides over meetings. The engineering departments arrange the meeting space reservations and other meeting logistics.

2. Evidence of Faculty and Program Effectiveness

a. Degree Completion

The degrees awarded for both degree programs are shown in Figure 8.

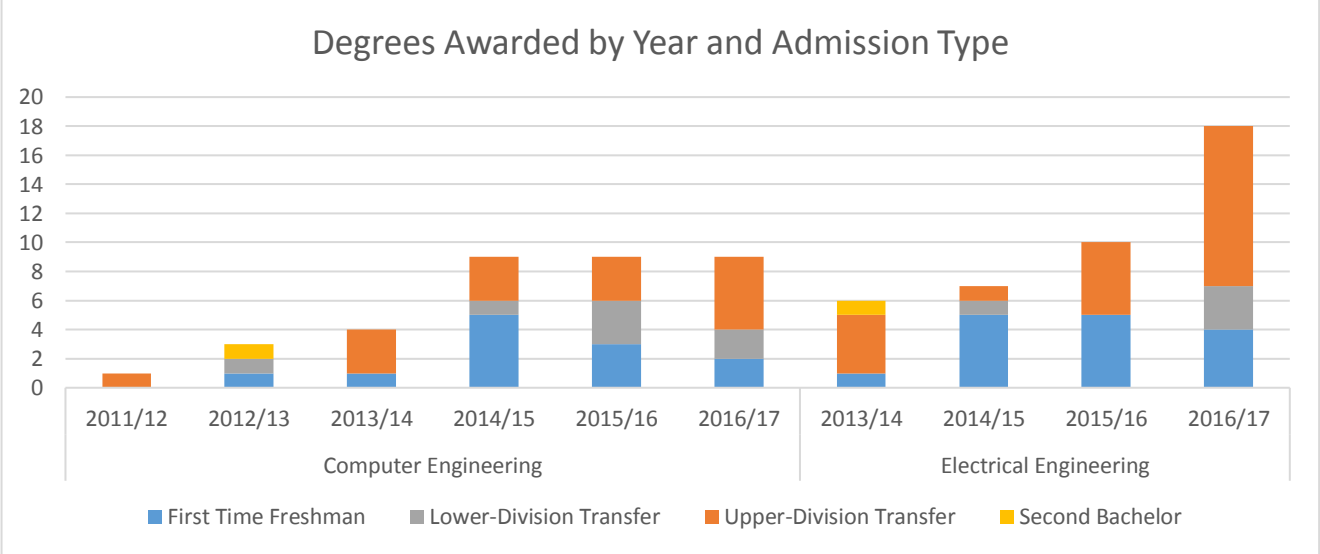

Figure 8: ECE Degrees Awarded by Year and Admission Type

Computer Engineering began in Fall 2011 (six years ago) and Electrical Engineering began in Fall 2012 (five years ago). This means the degrees are still too new to have sufficient data for 6-year graduation rates.

Time-to-degree metrics were also problematic to analyze as the Tableau data for first-time freshman had an obvious calculation error, as evidenced by the data in Figure 9. It is highly unlikely that the time-to-degree for

first time freshmen is the same for all of CSUB, all of NSME, and both of the ECE programs. We would expect a longer time for degree for the ECE programs due to the difficulty of completing the mathematics cognates for our service population.

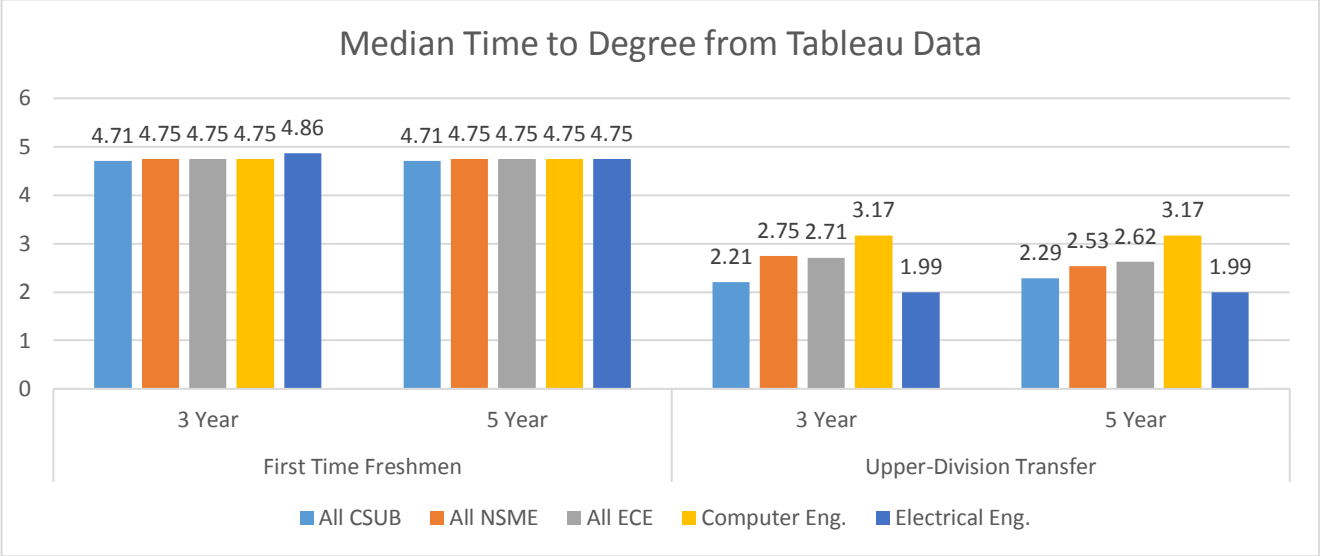

Figure 9: Median Time to Degree Comparison According to Tableau Data

An additional complicating factor for first time freshman is the relative "newness" of the programs. First time freshman who were admitted after the programs began would have had to finish in 6 years or less for Computer Engineering and in 5 years or less for Electrical Engineering to be included in the median time-to-degree metrics. For this reason, the department estimated the median time-to-degree separately for students who were admitted before the degree began (indicating they started in another degree and switched to the degree after they began) and who were admitted after the degree began. This results in the data shown in Figure 10.

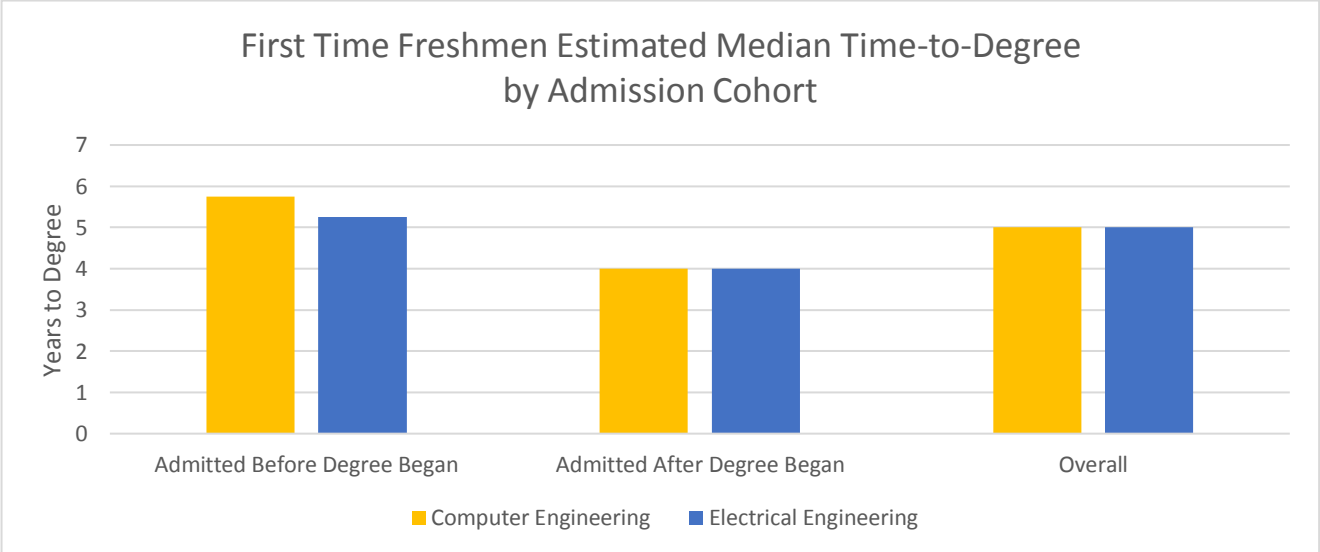

Figure 10: Estimated First Time ECE Freshman Median Time to Degree Based on Admission Cohort

As expected, first time freshmen who were admitted before the degree began took longer to complete than those admitted after the degree began, since they had to switch majors at least once to switch to engineering.

Returning to the upper-division transfer student median time-to-degree in Figure 9, Computer Engineering graduates in this cohort took slightly longer than 3 years while Electrical Engineering graduates took 2 years.

Students were categorized as upper-division transfer students due to their total transfer units and lower-division general education transfer courses, not due to their readiness to complete an engineering major. The department considers students to be ready for upper-division ECE coursework if they have completed the following courses with a grade of C- or better: one year of calculus, two terms of physics, one lower-division circuits course, and at least one term of programming. Only 7% of the Computer Engineering upper-division transfer students entered CSUB ready for upper-division ECE coursework. On the other hand, 53% of the Electrical Engineering upper-division transfer students were ready for upper-division ECE coursework. This explains why the upper-division time-to-degree for Computer Engineering graduates was a median of 3 years: they had to complete additional lower-division coursework after transferring to CSUB.

b. Comparison to Other Universities

We compared the Computer Engineering program and the Electrical Engineering program to four other CSU campuses: CSU Fresno, CSU Long Beach, CSU Chico, and CSU Northridge. We selected other CSUs that have been on the semester-system for several years and that are ABET accredited for both Computer Engineering and Electrical Engineering. Additionally, we looked for other CSU campuses that had accredited engineering programs at or below 120 semester units, but we only found that the Computer Engineering program at CSU Fresno and the Electrical Engineering program at CSU Long Beach were below this unit limit.

Computer Engineering Comparison

For Computer Engineering, the range of units for major + cognate at the other campuses is 95 to 103 semester units, while CSUB has 95 semester units for major + cognate (low compared to other CSUs). The range of unique GE units at the other campus is 21 to 27, while CSUB has 24 unique GE units (normal compared to other CSUs). The other campus had an overall unit count ranging from 120 to 127, while CSUB has an overall unit count of 120 semester units.

Since there are fewer major and cognate units in CSUB's Computer Engineering program, we are weaker in some areas of the curriculum. At the lower division level, many other CSUs have a required course in MATLAB programming, in addition to the one-year freshman programming sequence. Beginning Fall 2017, CSUB has added some introduction to MATLAB programming modules to ECE 1628 Introduction to Engineering II, but this is not as robust as a full course focusing on MATLAB. At the upper division level, some of the other CSUs offer a two-semester sequence for analog circuits, while CSUB offers just a single semester course in this area.

Within the cognates, there are some weaknesses in mathematics and general science. Many of the other CSUs, and the statewide Model Curriculum for Computer Engineering transfer students, require a differential equations course, but CSUB does not have sufficient free units to offer this course. Many other CSUs also require a general chemistry course for Computer Engineering students, but CSUB does not have sufficient units for this either.

For other areas in both the major and the cognate, CSUB's curriculum matches that of the other CSUs, the Model Curriculum, and the requirements of ABET for a Computer Engineering program. See Appendix H. Curriculum Comparison to Other CSUs for a complete comparison table.

Electrical Engineering Comparison

For Electrical Engineering, the range of units for major + cognate at the other campuses is 93 to 100 semester units, while CSUB has 90 semester units for the major + cognate (low compared to other CSUs). The range of unit GE units for Electrical Engineering is 24 to 27 at the other campuses, while CSUB has 24 unique GE units (normal compared to other CSUs). The other campus had an overall unit count ranging from 120 to 126, while CSUB has an overall unit count of 120 semester units.

As with Computer Engineering, CSUB's Electrical Engineering program is weaker in the areas of MATLAB programming, analog circuits, and differential equations compared to the other CSUs due to having a lower number of major and cognate units. Electrical Engineering students are required to take a general chemistry

course at CSUB, which is consistent with the other CSUs.

For other areas in both the major and the cognate, the Electrical Engineering curriculum at CSUB matches that of the other CSUs, the Model Curriculum, and the ABET requirements for an Electrical Engineering program. See Appendix H. Curriculum Comparison to Other CSUs for a complete comparison table.

c. Faculty Scholarship and Creative Activities

Appendix D has the brief faculty vita for the CEE/CS faculty members in the 2016/17 academic year using the required ABET vita format. The brief CVs highlight important publications and other scholarly activities undertaken by faculty members of the department.

A majority of the reputable technical conferences and journals in the field of Electrical and Computer Engineering are run or organized by the Institute of Electrical and Electronics Engineers (IEEE). In a way, all the publications in IEEE conferences and journals meet the minimum standards expected by the department. Among those publications, some carry higher weight. For instance, Google Scholar listed several of them in its top 100 technical publications measured by h5-index, including IEEE Conference on Computer Vision and Pattern Recognition, IEEE Transactions on Power Electronics, IEEE Transactions on Industrial Electronics, and IEEE Transactions on Pattern Analysis and Machine Intelligence. One simple indicator among journals are IEEE Transactions. These journals are highly competitive and only publish cutting-edge research. Besides IEEE, there are many other reputable publications. One simple way to identify those are by the Impact Factor. A rule of thumb is any journal in the field of Electrical and Computer Engineering with an impact factor higher than one is a fairly strong journal.

The scholarly activity of ECE faculty members greatly involves undergraduate students. Undergraduate research is a high-impact practice that provides the students with hands-on research activity. Undergraduate research also better prepares the students for graduate school and engineering careers. As previously noted, several ECE students have published as primary authors in peer-reviewed publications as a result of their research experiences.

3. Evidence of Program Serving the Community

a. Applied Learning

Students receive career advising through a combination of discussions with their faculty advisor, informal discussions with faculty members, and career fairs organized by the campus career center. The CEE/CS department also hosts career development seminars targeted towards technical majors, such as the Fall 2015 and Fall 2016 career talks by Google employees. The engineering clubs also regularly host resume development workshops for engineering students.

Career opportunities are also fostered by the NSME Grants and Outreach (GO) department. NSME GO works to connect potential employers with NSME students through internships, job shadowing, and mentorships. NSME GO also coordinates tours of industry facilities and informational sessions with areas of interest to NSME students, such as agricultural engineering and aeronautical engineering. Additionally, NSME GO offers industry partners and potential employers the opportunity to interact with students conducting research through research design expos.

Under the semester catalog, students can opt to replace one course of technical electives (equivalent to 4 semester units) through special topic courses and independent study courses. Special topic courses cover a current topic in engineering or an engineering topic of relevance to the service area. Independent study courses can be for undergraduate research, internships, or cooperative education. Students under the quarter system catalog can also petition the department to use one of these courses as an elective.

Up to 4 units of technical electives can also be replaced with prior experiential learning. The amount of credit for experiential learning is determined only after faculty assessment of the scope and quality of the learning.

Students must have support of their faculty advisor and department chair to receive credit for prior experiential learning. A petition for experiential prior learning, with supporting documentation from the student and employer, is signed by the faculty advisor and department chair to indicate their support. This petition is then turned in to the Undergraduate Studies office for processing. Awarded experiential prior learning credit is recorded as ECE 489/4890 (Experiential Prior Learning) course credit on PeopleSoft.

b. Student Recruitment

The department has been highly active in NSME high school outreach efforts. When CSUB was the host for Engineering Day, faculty and students in the department would help with the lab tours to show the high school students our engineering facilities. Department representatives have also given talks about the department and programs during NSME Open House Night. Some faculty have also gone out to high schools to give talks to high school students, such as discussing cybersecurity of the energy sector at the Shafter Learning Center. Each summer, one or more faculty participates in REVS-UP, which brings high school students out to CSUB for a month of research in STEM. The department also recently collaborated with BPA, Kegley Institute of Ethics, KHSD, and County of Kern to host a Big Data Symposium for high school AP CS students in Fall 2017.

c. Faculty Recruitment

As part of the standard Provost's Office support for tenure-track advertising, position descriptions are placed on a variety of general diversity website for higher education positions. For tenure-track lines, the CEE/CS Department pays for further ad placement in IEEE and/or ACM, as appropriate for the open position. If there is sufficient funding, the department also places the ad on additional engineering and computer science diversity websites.

E. Evidence of Program Viability and Sustainability

1. Demand and Need for Program

The Computer Engineering program began in Fall 2011 and the Electrical Engineering program began in Fall 2012. Based on a market survey conducted prior to writing the proposals for these programs, we expected enrollments to grow to a headcount 120 full-time and part-time students in each program over the course of five years, as shown in Table 14. This projection is based on a 65% retention rate between freshman and sophomore years, a 55% retention rate between freshman and junior years, and a 50% retention rate between freshman and senior years.

Table 14: Projected Enrollment in Each ECE Program over the First Five Years

	Year 1	Year 2	Year 3	Year 4	Year 5
Freshmen	20	30	40	50	50
Sophomores		13	20	26	33
Juniors			11	17	22
Seniors				10	15
Total Enrollment	20	43	71	103	120

As shown in Table 15 and Table 16, both programs reached the enrollment target of 120 full-time and part-time students by their fifth year. Unaccounted for in the above projection was transfer student enrollment, rather than retention of freshmen students. Freshman student enrollments have not consistently reached 50 students per year for either program, but both programs have healthy transfer student enrollments. As previously shown in Figure 8, transfer students account for a significant number of the graduates in these formative years of the programs.

Table 15: Computer Engineering Enrollments and Degrees Awarded by Academic Year

Academic Year		Class Level				Total Undergrad	Total 2nd Bach	Total Degrees
		Freshman	Sophomore	Junior	Senior			
2016/17	FT	39	27	19	28	110	0	9
	PT	2	0	3	5	13	2	
2015/16	FT	59	21	23	18	121	1	9
	PT	2	5	6	5	18	2	
2014/15	FT	53	23	20	20	116	3	9
	PT	0	0	4	5	9	0	
2013/14	FT	44	22	14	20	100	1	4
	PT	1	0	1	6	8	1	
2012/13	FT	45	10	12	8	75	1	3
	PT	3	1	4	4	12	0	
2011/12	N/A	28	7	11	3	49	0	1

Table 16: Electrical Engineering Enrollments and Degrees Awarded by Academic Year

Academic Year		Class Level				Total Undergrad	Total 2nd Bach	Total Degrees
		Freshman	Sophomore	Junior	Senior			
2016/17	FT	26	23	31	27	107	3	18
	PT	6	0	6	7	19	1	
2015/16	FT	45	14	23	22	104	0	10
	PT	2	1	4	9	16	2	
2014/15	FT	19	13	16	18	66	1	7
	PT	0	1	1	1	3	2	
2013/14	FT	18	10	7	7	42	0	6
	PT	0	3	0	1	4	4	
2012/13	FT	6	3	2	1	12	0	0
	PT	1	0	0	1	2	0	

The department has also projected enrollment trends as part of its planning process. For Computer Engineering, enrollments have stabilized at around 120-140 majors per year for several years, as shown in Table 15. Electrical Engineering on the other hand is still in a growth phase, as shown in Table 16. Fall 2017 enrollment data shows that enrollments in Electrical Engineering are still increasing. This constant increase in enrollments makes it difficult to project future enrollment trends for Electrical Engineering. Both majors may also receive an increase in enrollments once the programs are successfully accredited by ABET.

The department used multiple methodologies to project growth based on previous enrollments. The three projection methodologies are linear growth regression analysis, logarithmic growth regression analysis, and a running three-year average. The results are summarized in Figure 11, using preliminary Fall 2017 enrollment numbers for the 2017/18 academic year. For Computer Engineering, the projection analysis shows anywhere from 125 to 177 students by 2020/21. For Electrical Engineering, the projection analysis shows anywhere from 141 to 243 students by 2020/21, depending on whether or not enrollments stabilize or continue growing after the 2017/18 academic year.

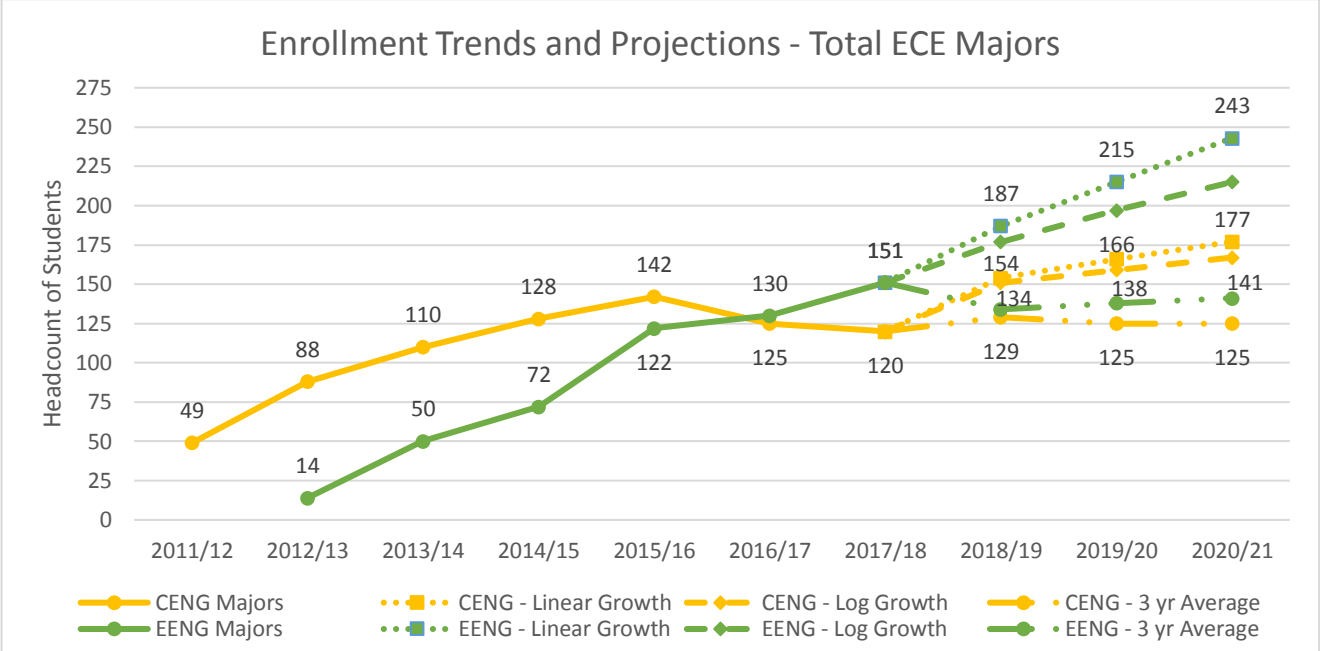

Figure 11: Enrollment Trends and Projections for Computer Engineering and Electrical Engineering

Course-level demand from ECE students also continues to grow, as shown in Figure 12. While the overall department FTES experienced a "semester dip" due to the loss of a computer science GE course during the semester conversion, the FTES on the ECE side of the department continues to grow and has not slowed down with the semester conversion. We expected this to continue, as more ECE students complete the calculus and physics sequences and begin enrolling in upper-division ECE courses.

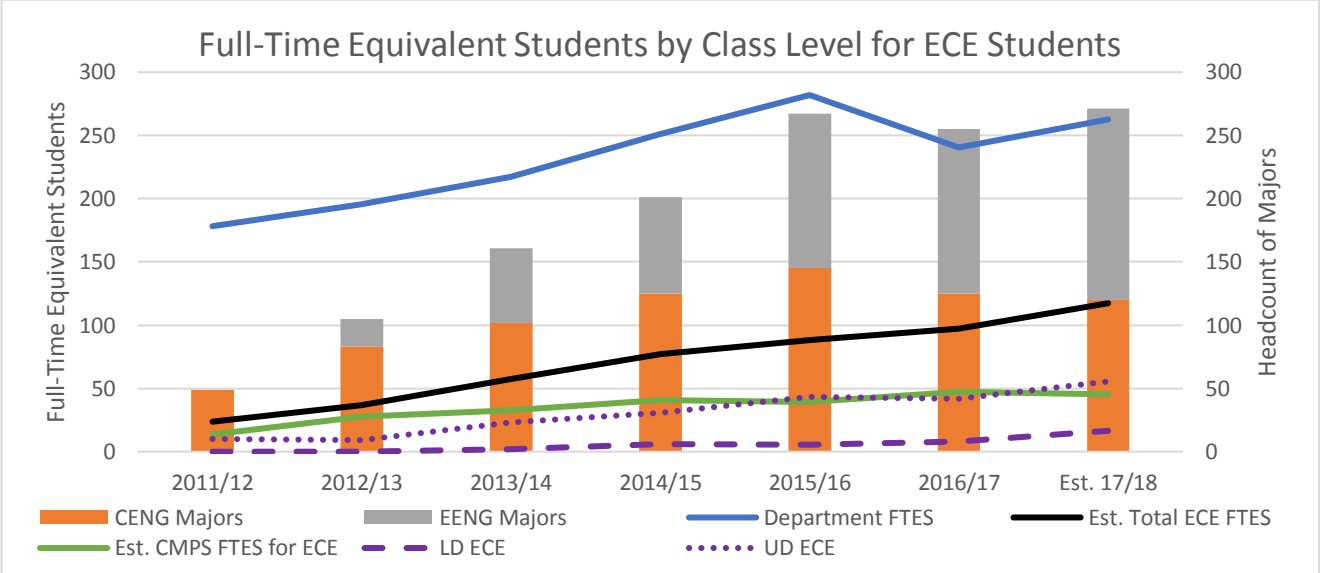

Figure 12: Full-Time Equivalent ECE Students by Class Level and Academic Year

With respects to input from the profession and local trends, the initial programs used feedback from a market survey conducted in March 2010. The market survey looked at both student interest (high school, BC, and CSUB students) and regional employer needs. The primary skills that employers identified in the market survey were having hands-on experiences and teamwork projects. This is one of the reasons why we chose a two-term, teamwork-based approach to senior design project. Two terms gives the students sufficient time to have meaningful, hands-on design experience and allows them to develop their teamwork skills.

As mentioned previously, the department also regularly meets with its Industrial Advisory Board for feedback on the skills and attributes needed to be a successful engineer in various employment sectors in Kern County. This regular interaction with practicing engineers in local industry allows the program to be responsive to the needs of local employers.

2. Faculty Resources

The faculty members for the 2016/17 academic year are listed in Table 17 and the workload (WTUs) for each faculty member in the 2016/17 academic year is listed in Table 18.

Table 17: CEE/CS Faculty Members for 2016/17 Academic Year

Faculty Name	Highest Degree Earned- Field and Year	Rank	Years at CSUB as of 2016/17 AY	Primary Area	Overall Effort for 2016/17 AY		
					Purely CMPS	Purely ECE	Both CMPS and ECE
Reza Abdolee	Ph.D. ECE 2014	Assist.	1 yr	ECE	0%	100%	0%
Anthony Bianchi	Ph.D. EE 2014	Assist.	1 yr	CMPS	63%	0%	37%
Alberto Cruz	Ph.D. EE 2014	Assist.	3 yr	CMPS	63%	0%	37%
Melissa Danforth (Chair)	Ph.D. CS 2006	Prof.	11 yr	CMPS	37%	23%	40%
Saeed Jafarzadeh	Ph.D. EE 2012	Assist.	5 yr	ECE	0%	100%	0%
Chengwei Lei	Ph.D. CS 2014	Assist.	1 yr	CMPS	83%	0%	17%
Wei Li	Ph.D. ECE 1991	Prof.	16 yr	ECE	0%	100%	0%
Vida Vakilian	Ph.D. EE 2014	Assist.	3 yr	ECE	0%	100%	0%
Huaqing Wang (FERP)	Ph.D. CS 1988	Prof.	29 yr	CMPS	50%	0%	0%
J. Antonio Cardenas-Haro	Ph.D. CS 2010	FTL	1 yr	CMPS	50%	0%	50%
Gordon Griesel	MBA 2006	FTL	4 yr	CMPS	50%	0%	50%
Derrick McKee	B.S. CS 2012	FTL	5 yr	CMPS	50%	0%	50%
Ehsan Reihani	Ph.D. ME 2015	FTL	1 yr	ECE	0%	83%	17%
Steven Garcia (FT staff)	B.A. Physics 1978	PTL	13 yr	CMPS	33%	0%	0%
Weiguo (James) Luo	Ph.D. Civil Eng. 2005	PTL	1 yr	ECE	0%	28%	0%
M. Jay Manibo	B.S. CS 1997	PTL	4 yr	CMPS	0%	0%	67%
Walter Morales	M.S. Petro. Eng. 2015	PTL	2 yr	CMPS	0%	0%	15%
Edward Rangel	M.S. Soft. Eng. 2015	PTL	1 yr	CMPS	0%	0%	17%
Michael Sarr	B.S. CS 2004	PTL	6 yr	CMPS	0%	0%	33%

Table 18: Workload for CEE/CS Faculty Members in 2016/17 Academic Year

Faculty Name	CS Only			ECE Only			Both CS and ECE		
	Teach	Research	Service	Teach	Research	Service	Teach	Research	Service
Reza Abdolee				15	9	6			
Anthony Bianchi	13		6				5	6	
Alberto Cruz	13		6				5	6	
Melissa Danforth	5		6			7			12
Saeed Jafarzadeh				14	10	6			
Chengwei Lei	13	6	6				5		
Wei Li				10	14*	6			
Vida Vakilian				18	6	6			
Huaqing Wang	10		5						
Antonio Cardenas	15						15		
Gordon Griesel	15						15		

Derrick McKee	10		5+				15		
Ehsan Reihani				25			5		
Steven Garcia	10								
Weiguo (James) Luo				8.5					
M. Jay Manibo							20		
Walter Morales							4.5		
Edward Rangel							5		
Michael Sarr							10		

* Wei Li was on sabbatical for Fall 2016, which is counted as 12 WTU in the research column.
+ Derrick McKee receives 5 WTU to maintain the department websites and to help faculty with their websites.

Overall, about 1/3 of the department has responsibility purely on the Computer Science side, about 1/3 of the department has responsibility purely on the Electrical and Computer Engineering side, and about 1/3 of the department has responsibilities that affect both sides of the department. As a very rough approximation, the percentage of effort for those with responsibilities to both sides of the department, is split as 60% CS and 40% ECE. That leads to the overall breakdown of effort by area (where %CS + % ECE = 100% for all faculty, including part-time lecturers) given in Table 19.

Table 19: CEE/CS Faculty Responsibility Broken Down by Department Area

Tenured/Tenure-Track				**Lecturers**		
	% CS	% ECE			% CS	% ECE
Reza Abdolee	0%	100%		Antonio Cardenas	80%	20%
Anthony Bianchi	85%	15%		Gordon Griesel	80%	20%
Alberto Cruz	85%	15%		Derrick McKee	80%	20%
Melissa Danforth (Chair)	60%	40%		Ehsan Reihani	10%	90%
Saeed Jafarzadeh	0%	100%		Steven Garcia	100%	0%
Chengwei Lei	93%	7%		Weiguo (James) Luo	0%	100%
Wei Li	0%	100%		M. Jay Manibo	60%	40%
Vida Vakilian	0%	100%		Walter Morales	60%	40%
Huaqing Wang	100%	0%		Edward Rangel	60%	40%
				Michael Sarr	60%	40%

The tenure-track density, both when looking at faculty by their primary area of responsibility (Figure 13) and by their above weighted areas of responsibility (Figure 14), show that the ECE side of the department has a higher overall density, but that tenure-track density is decreasing for both sides of the department.

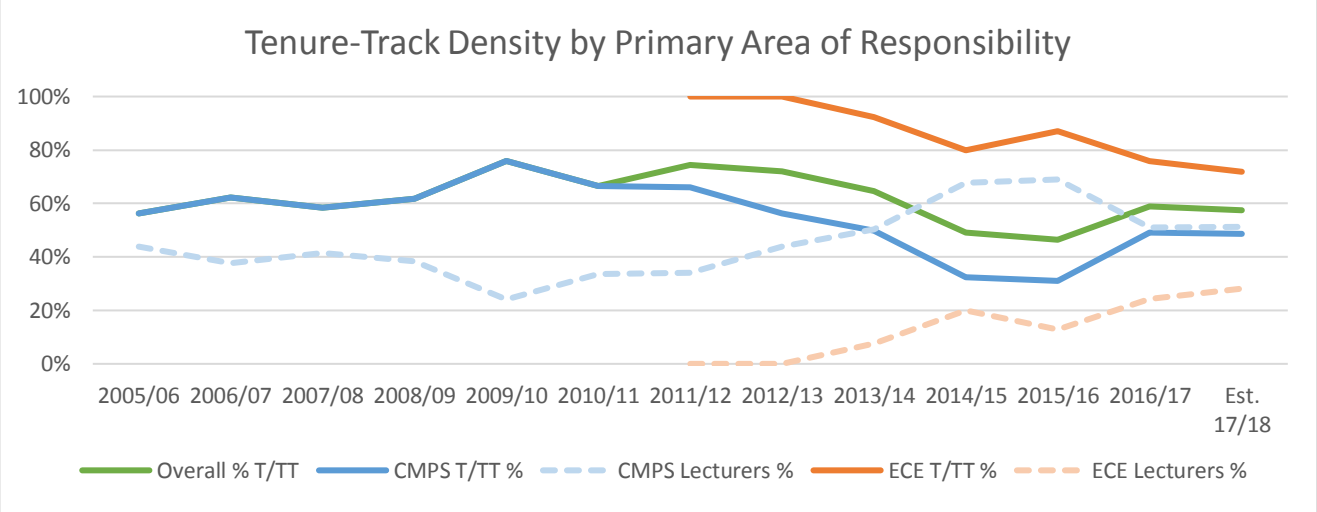

Figure 13: CEE/CS Tenure-Track Density by Primary Area of Responsibility

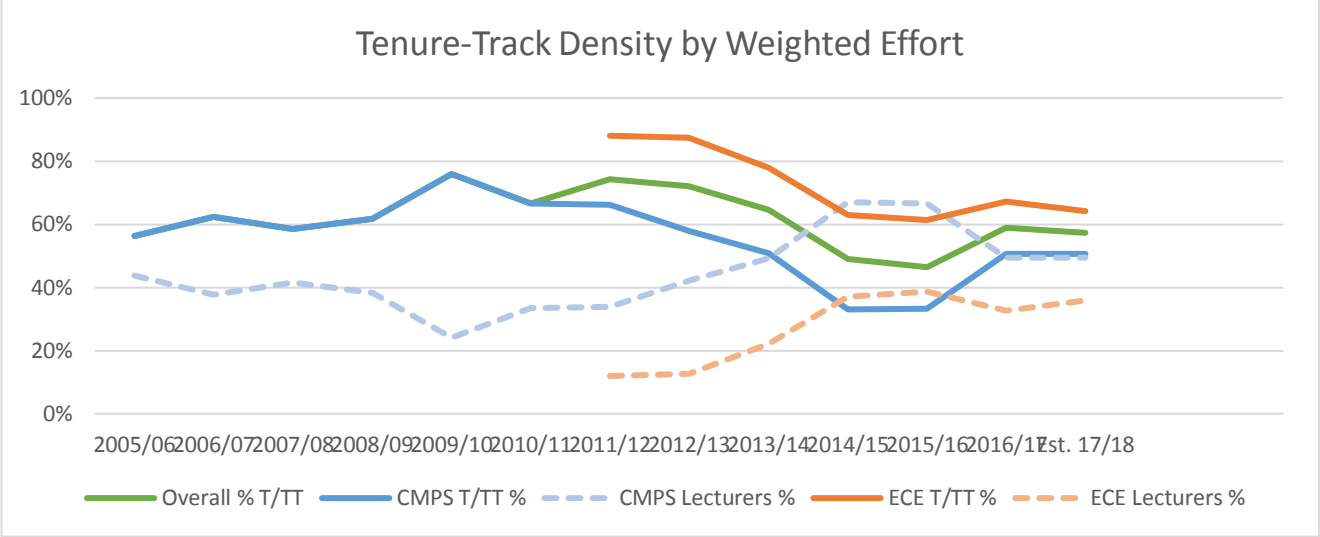

Figure 14: CEE/CS Tenure-Track Density by Weighted Responsibility to Department Areas

The faculty members teaching or conducting research in electrical and computer engineering have areas of expertise covering all areas in which the program offers core courses and technical electives. The specific areas of expertise for the engineering faculty members are as follows:

Digital Communication / Digital Signal Processing
- Dr. Reza Abdolee (primary specialization)
- Dr. Vida Vakilian (primary specialization)

Digital Design / Embedded Systems
- Dr. Wei Li (primary specialization)
- Dr. Reza Abdolee (secondary specialization)
- Dr. Alberto Cruz (secondary specialization)
- Dr. Vida Vakilian (secondary specialization)

Robotics / Control Systems
- Dr. Wei Li (primary specialization)
- Dr. Alberto Cruz (secondary specialization)
- Dr. Saeed Jafarzadeh (secondary specialization)
- Dr. Ehsan Reihani (secondary specialization)

Power Systems / Power Electronics
- Dr. Saeed Jafarzadeh (primary specialization)
- Dr. Ehsan Reihani (primary specialization)
- Dr. Wei Li (secondary specialization)

Image Processing / Computer Vision
- Dr. Anthony Bianchi (primary specialization)
- Dr. Alberto Cruz (primary specialization)

Faculty members make use of campus resources for professional and leadership development, including the Provost's travel support, mini-grants and workshops from the TLC, RCU grants, and other workshops and support. Faculty members also use sabbatical leave and difference in pay leave to support their scholarly activities.

With respects to mentoring, the department does not have a formal mentoring program for junior faculty members. New faculty members receive regular feedback on their performance through annual reviews at the departmental and school level and through the annual classroom observation reports. Informal mentoring does occur to train new faculty in advising and new faculty are encouraged to shadow an existing faculty member during advising to learn more about the advising process.

Retention of engineering faculty members is a concern of the department. Since the start of the engineering program, three junior faculty members on the engineering side of the department have left within the first few years of employment. Two left for programs with graduate students and one was not a good fit for the department. A graduate program would help with retaining those faculty members interested in conducting graduate-level research. We have replaced two of those faculty members and are currently looking for the third replacement line to begin in Fall 2018.

3. Financial Resources

Analyzing the fiscal costs of the department is difficult since the IRPA provided salary data in the annual program profile is greater than the salary data in CFS Data Warehouse by anywhere from $15,000 to $80,000 each year since 2011/12. Since CFS provided the most transparent source of data, it was used for this section. Figure 15 shows department salaries broken down by primary area of responsibility to the department. This roughly corresponds to the breakdown provided in the most recent IRPA annual program profile.

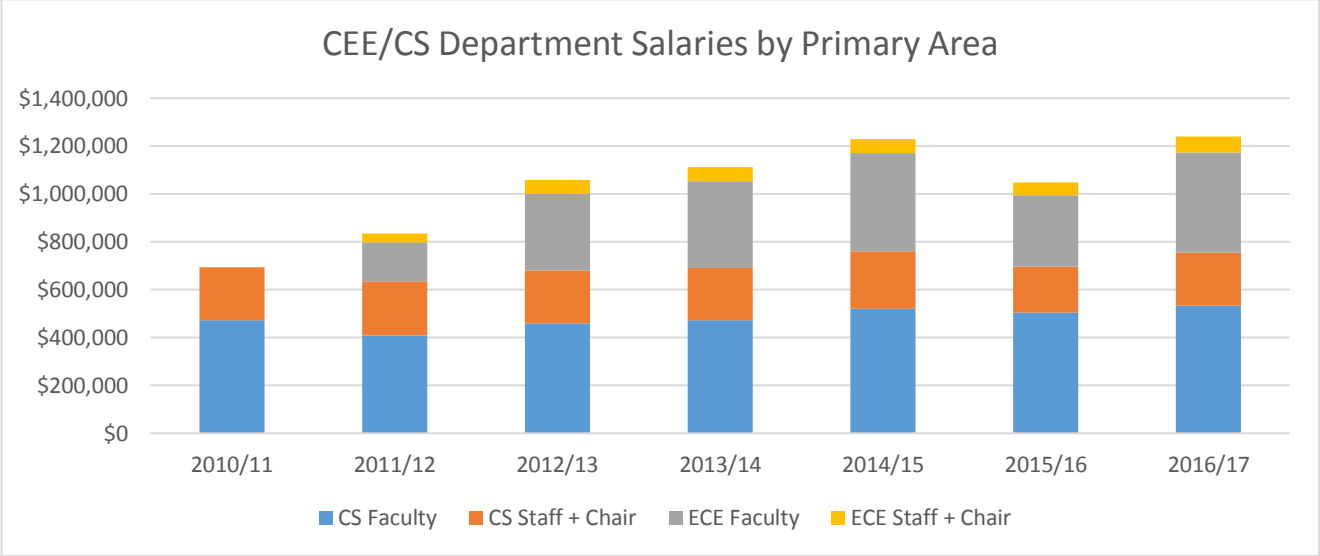

Figure 15: CEE/CS Department Salaries by Primary Responsibility to Department Area

However, as pointed out in the above faculty section, faculty whose primary department area is CS have varying degrees of effort expended on the ECE programs. In particular, CS lecturers teaching most lower-division CMPS courses are teaching a mix of CS, CE, and EE students. Additionally, staff members may support both sides of the department. The salary breakdown in Figure 16 accounts for this overlap and it also shows the salary offsets from new faculty release time, faculty research grants, and the U.S. Department of Education Computer Engineering grant. The CFS data provided sufficient detail to calculate the weighted percentage of effort at the individual level, which captures the faculty and staff who are primarily assigned to the CS side of the department, but greatly support the ECE side of the department.

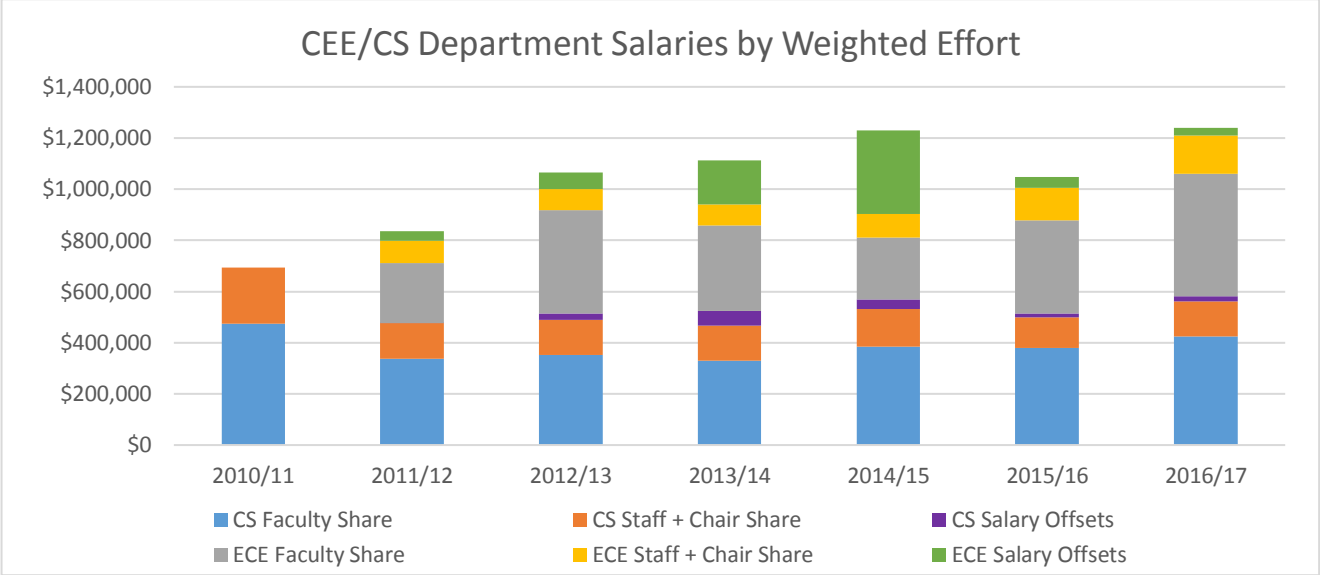

Figure 16: CEE/CS Department Salaries by Weighted Responsibility to Department Areas

The CSUB engineering programs were started through multimillion dollar U.S. Department of Education capacity building grants. As shown in Figure 16, these grants paid a portion of the salaries of engineering faculty members and staff for the initial years of the program. The salaries for engineering faculty members and staff have since been added to position control and have become part of the institution's base budget.

Additionally, as shown in Figure 17, the Department of Education grants paid for a majority of the initial engineering equipment costs. Donations have also supported the engineering programs specifically and NSME in general. The engineering programs received a one million dollar donation from Chevron to support engineering equipment acquisition. This donation was shared equally between the ECE programs and the Engineering Sciences program. Faculty have also been active in writing research grants and the ECE faculty have secured external funding to support their research programs. Figure 17 summarizes the total funding from these sources that support both the Computer Engineering and Electrical Engineering programs. This figure does not include funding that supported the Computer Science program.

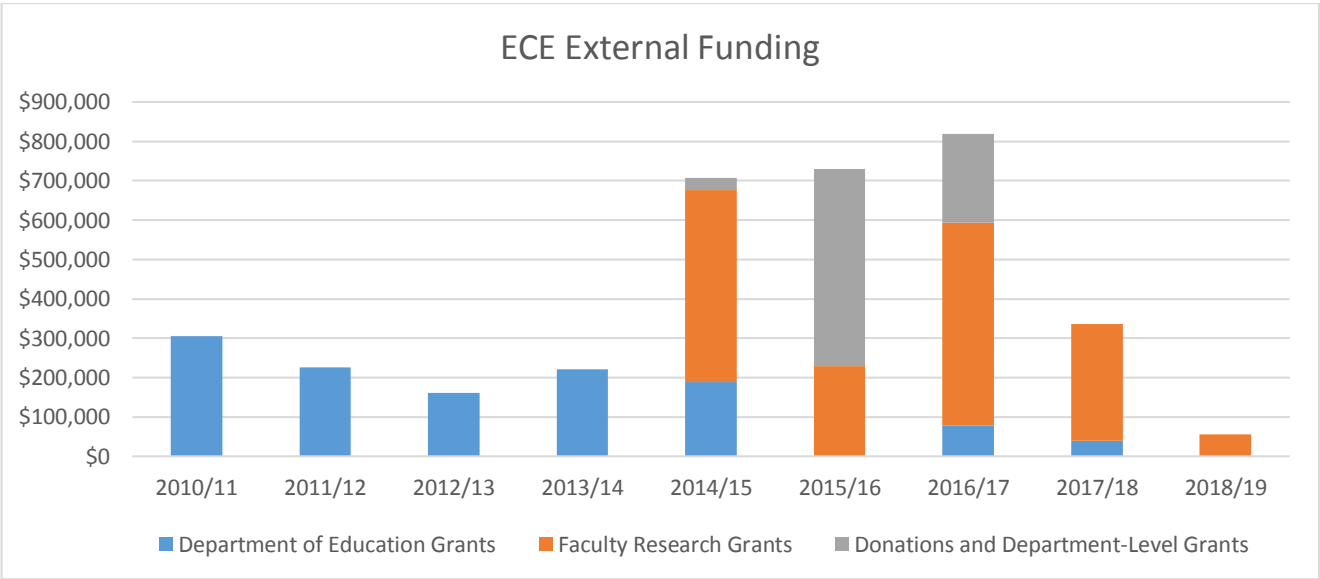

Figure 17: External Funding to Support the ECE Area of the Department

4. Supplies, Equipment, and Other Resources

a. Information and Technology Resources

The CEE/CS department maintains extensive technology resources to support the programs. The department currently has four computer/engineering labs in Science III that primarily support the ECE program, three computer teaching labs in Science III that support both the ECE and Computer Science programs, one computer lab in Science III for department tutoring, one research lab in Science III that supports the Computer Science program, one shared research lab in Science III (shared with Physics & Engineering), one shared lab in the Engineering Complex (shared with Physics & Engineering), and one shared research lab in Science II (shared with biology). The computers used for the ECE programs in Science II and Science III are maintained by staff members within the department. The computers in Engineering Complex are maintained by ITS.

The department also maintains its own server room in Science III. The teaching servers are used extensively in the CMPS courses taken by ECE students, particularly for programming courses. Students can access the servers from any Internet-connected device using free SSH software, then complete their programming assignments using open-source programming tools. This means there is no cost to the students to learn how to program, other than having access to an Internet-enabled computer. The department server room also hosts research servers for both CEE/CS faculty and faculty in other NSME departments.

The software resources listed in Table 20 also support the ECE programs. This software is available in the department-supported computer labs in Science III, as supported by the operating system (i.e. Linux workstations will not have Windows-only software available unless that software runs well under virtualization or emulation).

Table 20: CEE/CS and NSME Software Resources to Support the ECE Programs.

Description	Seats
National Instruments LabVIEW, Multisim, and Ultiboard software package	Unlimited
Cadence University Program	Unlimited
Altera Quartus II	Unlimited
Xilinx ISE WebPACK	Unlimited
MATLAB and Simulink (base system)	45
- General toolboxes: Communications, Computer Vision, DSP, Embedded Coder, Fixed-Point, Fuzzy Logic, Global Optimization, Image Processing, MATLAB Coder, MATLAB Compiler, MATLAB Compiler SDK, Neural Network, Optimization, Partial Differential Equation, Signal Processing, Simulink Coder, Statistics and Machine Learning, Symbolic Math	30 – 40
- Specialty toolboxes: Bioinformatics, Control System, Curve Fitting, Data Acquisition, HDL Coder, HDL Verifier, Image Acquisition, Instrument Control, Simscape, Simscape Power, Wavelet	10 – 15
Autodesk AutoCAD	30
SOLIDWORKS (“Network” educational license plan)	2000
Linguistic Inquiry and Word Count Semantic Analysis software	8
VMware Workstation (research license)	50
VMware Academic Program (educational use by faculty and students)	Unlimited
Microsoft DreamSpark (educational use by faculty and students)	Unlimited

b. Equipment and Facilities

Table 21 lists the laboratories and the equipment contained within those labs for the rooms that primarily support the ECE programs. With the exception of EC II 201, which is shared with Physics and Engineering, and Science II 165, which is under the control of the NSME dean’s office, the department has complete control over the scheduling and use of these labs.

Table 21: Electrical and Computer Engineering Specialty Laboratories

Room	Capacity	Description
Sci. III 309 546 sq. ft.	20	Digital Signal Processing and Digital Communications Lab: • 11 Dell computers with attached NI Elvis II+ platform ○ NI Emona FOTEx, DATEx, SIGEx plug-in boards • 8 NI Universal Software-defined Radio units • 10 oscilloscopes and multimeters • 10 function generators • 5 signal analyzers Courses: Signals and Systems, Fields and Waves, Digital Communications, Digital Signal Processing, Wireless Networks, Wireless Communications
Sci. III 312 1159 sq. ft.	24	Robotics and Control Systems Lab: • 14 Dell computers with attached NI Elvis II+ platform ○ NI FPGA, QNET motor, HVAC, VTOL, and inverted pendulum plug-in boards • Kumotek and Nao humanoid robots • Quadrotor and hexacopter drones • Mobile robot platforms and Amigabots • Lego Mindstorms EV3 kits Courses: Control Theory, Embedded Systems, Data Acquisition, Robotics, High Speed Rail (split facilities with Sci. II 165 below)
Sci. III 313 1051 sq. ft.	32	Digital / Analog Circuits and VLSI Lab: • 17 Dell computers with attached NI Elvis II+ platform • 15 Altera DE2 VHDL boards • Various IC and components for digital and analog circuits • Various kits for introduction to engineering courses Courses: Digital Circuits, Analog Circuits, Digital Design with VHDL, Microprocessor System Design, Introduction to Engineering I & II Room is also used as lecture space for medium-sized courses with laboratories in Sci. III 309.
Sci. III 328 612 sq. ft.	20	Computer Perception Lab: • 8 Dell computers with attached CameraLink cameras • 8 BeagleBone Black boxes with HD cameras for image processing and computer vision • 2 Raspberry PIs with long-range infrared thermography cameras for image processing and computer vision Room is primarily used as an undergraduate research assistant space. Courses: Image Processing, Computer Vision
EC II 201 1160 sq. ft. (shared w/ Engineering Sciences)	15	Power Systems and Semi-Conductor Lab (only ECE equipment is listed): • 12 Dell computers • 7 Lab-Volt (Festo Didactic) Electromechanical Training Systems • 1 Lab-Volt (Festo Didactic) Home Energy Production Training System (renewable energy) Courses: Power Systems Fundamentals, Power Electronics and Electrical Drives, Mechatronics, Power System Analysis, Power System Operation with Renewable Energy Resources
Sci. II 165 148 sq. ft. (shared w/ Biology)	15	High Speed Rail Simulator (only ECE equipment is listed): • One high speed rail training system. This is a full-sized cockpit simulator which can create scenarios such as rain, sleet, snow, and hail for students to navigate through.

		• Additional simulation computers can be located either in this room or the Robotics laboratory above. Courses: High Speed Rail (split with Sci. III 312 above)

5. Oversight and Management of Resources

The department is responsible for maintenance of the above equipment and computers in the department labs. The department employs a full-time system administrator to maintain the server room and computer labs and a full-time equipment technician to maintain the equipment in the ECE specialty labs.

Decisions involving the overall budget and strategic direction are handled by the dean in conversation with the department chair and the provost. Operating expenses are managed at the department level. Current and projected expenses are reported to the dean's office on a monthly basis and the department chair and administrative support coordinator meet with the dean and the dean's budget analyst on a quarterly basis to discuss the expenses.

Major and minor capital improvement projects are submitted by the department to the dean's office. These projects are prioritized at the school and university level on an annual basis. Equipment acquisitions to date have been primarily funded through the capacity building grants that were used to start the engineering programs, through corporate donations, and through new faculty start-up funds. Replacements and upgrades are prioritized by the department as part of the major and minor capital improvement requests, but may be funded through other means such as donations, lottery funds, and grants.

F. Summary Reflections

1. How are the curriculum, practices, processes, and resources properly aligned with the goals of the program?

The goals of the ECE programs are given in Table 1: Program Educational Objectives for ECE Students 3-5 Years after Graduation. These goals can be summarized as producing engineering graduates who can a) be productive engineers, b) be ethical engineers, c) enhance the economy, and d) be effective with engineering project development and management. Each of these program education objectives is supported by multiple student learning outcomes and each student learning outcome is supported by multiple courses to develop competency over the course of each program.

2. How are department/program goals aligned with the goals of the constituents that the program serves (e.g., the students, the university as a whole, the service community)?

The PEOs were developed in consultation with the department faculty and the engineering Industrial Advisory Board. The PEOs are related to the university mission statement and to NSME's mission statement. The PEOs reflect skills that are vital to being a practicing engineer, so our program is appropriately preparing our students for careers in Electrical and Computer Engineering.

3. How is the level of program quality aligned with the college/university's acceptable level of program quality? Aligned with the constituents' acceptable level of quality?

Engineering degrees have a strong expectation of quality, as reflected in the ABET general requirements for all engineering programs and specific requirements for ECE programs. ABET accreditation is critical for students who wish to become a Professional Engineer (PE) or who wish to pursue careers in sectors which only hire from ABET accredited programs. Both programs are designed to be compliant with the ABET requirements as outlined in Table 6: ABET Curricular Requirements for Electrical Engineering and Computer Engineering Programs.

The programs are also aligned with California-wide standards for Electrical Engineering and Computer Engineering programs, such as the Engineering Model Curriculum on C-ID.net, and international standards, such as the ACM/IEEE Body of Knowledge for Computer Engineering and the Fundamentals of Engineering Exam for Electrical and Computer Engineering. As shown in our curriculum comparison to other CSUs on page

24, our programs are in line with what is offered by other CSUs, with the caveat that many other CSUs are grandfathered into high-unit majors (over 120 semester units), so they have more coverage of certain topics than CSUB.

4. How well are program goals being achieved?

Feedback from the engineering Industrial Advisory Board about graduates has been positive, although no formalized study has been conducted with area employers since the start of the program (the Market Survey was conducted before the programs began). The department has been able to track the placement of about half of the initial graduates of both programs. These graduates have found gainful employment in industry or government, or are attending graduate school, as shown in Figure 7. Computer Engineering graduates are more commonly finding employment in software engineering or IT-related jobs, while Electrical Engineering graduates are more commonly finding employment as electrical or systems engineers. Electrical Engineering graduates are also more likely to pursue the Professional Engineer (PE) path by taking the Fundamentals of Engineering (FE) exam and applying for their Engineer in Training (EIT) certification with the State of California.

5. What student learning outcomes are achieved at the expected level?

As shown in our assessment results in Table 9 and Table 11, students are meeting or exceeding expectations in most of the student learning outcomes for both Computer Engineering and Electrical Engineering. There are three outcomes for Computer Engineering (3e, 3i, 3j) where expectations were conditionally met, but the department will take additional measurements in 2017/18 and reassess at the end of the year. Likewise, there is one outcome for Electrical Engineering (3h) where expectations were conditionally met and the department will take additional measures and reassess.

The primary weakness for both Electrical Engineering and Computer Engineering is the background knowledge in mathematics and science. As outlined in Table 12 and Table 13, we are working on foundational knowledge quizzes that can be administered at the start of a course to identify specific deficiencies, which would then allow us to determine the appropriate interventions to bring students up to proficiency.

This process of monitoring and reassessing is somewhat complicated by the change in ABET student learning outcomes which were announced by ABET in October 2017. However, the new ABET student learning outcomes have direct mapping to the existing ABET student learning outcomes, so trends can still continue to be monitored.

6. What are the challenges to program quality?

Development of the curriculum was a balancing act between the California regulations on units after transfer, the overall 120 semester unit limit, the units remaining to the major after general education and cognate courses were taken into consideration, and the curricular requirements of ABET. Compromises had to be made in the development of both ECE programs due to one or more of these constraints. While the department can identify several major and cognate courses (such as MATLAB programming, assembly / machine-level programming, additional analog circuits coursework, the third physics class in optics, and differential equations) that would strengthen the program and make it more comparable with other CSU programs, there are not sufficient units available to do so.

To further complicate this matter, in late 2016 there was a revision to the ACM/IEEE Body of Knowledge for Computer Engineering (CE 2016). The CE 2016 guidelines add more topics to the expected core of a Computer Engineering program. While these are not yet ABET program requirements for Computer Engineering, ABET recently changed the Computer Science program requirements to reflect the 2013 changes to the ACM/IEEE Body of Knowledge for Computer Science, so it would not be surprising if they do the same to Computer Engineering in the next few years. The department is currently discussing these changes to the Body of Knowledge for Computer Engineering.

II. Program Plan

A. Program Goals for Next Seven Years

The strength of the ECE program lays in its research foundation. Over the next seven years, we plan to expand our research capacity through more research opportunities for students, through more research collaborations, and by expanding the areas of research within electrical and computer engineering.

Undergraduate research is a proven high-impact practice that builds skills and keeps students engaged in their degree programs. Undergraduate research students gain meaningful hands-on experience through research projects that prepares them for productive careers in engineering, both in academia and in industry. We have added ECE 4800 Undergraduate Research as a technical elective option for both Computer Engineering and Electrical Engineering majors under the semester-system catalog, and we allow students to use the course as a substitution for a technical elective under the quarter-system catalog.

We also have many avenues to strengthen and enhance our research collaborations. Many CEE/CS faculty have many research areas that are relevant to the California Energy Research Center (CERC) at CSUB and we have been working with CERC to develop research collaborations. CEE/CS faculty are also interested in developing multidisciplinary research with other parts of campus, such as economic models for smart grid management and control or using image processing for biomedical research. Similarly, research collaborations with other CSU campus and UC campus could be developed in many areas.

We also plan to develop research capacity in areas that are currently lacking entirely or where only one faculty member currently specializes. Traditional Computer Engineering areas, such as circuitry, electronics, microprocessors, robotics, and embedded systems, are currently weak as most of our faculty hold Electrical Engineering degrees. Research areas of importance to the community, industrial partners, and government/military partners are also important to develop, as that will strength collaborations as well as expand our research areas.

Another goal of the ECE programs is to obtain and retain ABET accreditation for Computer Engineering and for Electrical Engineering. Accreditation is a continual process that requires attention every year to maintain compliance with ABET requirements. As stated in the Self Study, ABET accreditation is critical for engineering students, as they cannot apply for certain jobs and their pathway towards becoming a registered Professional Engineer is impeded when they do not graduate from an accredited program. For example, one cannot apply for engineering jobs with the military, even as civilian contractors, without graduating from an accredited program. This means our graduates cannot apply for engineering jobs at Edwards AFB or China Lake NWS.

ABET accreditation requires continuous adherence to campus and department policies and procedures with documentation of that adherence (Criterion 1), frequent consultation with constituents through our Industrial Advisory Board (Criterion 2), a plan for assessment and continuous improvement based upon assessment (Criteria 3 and 4), alignment of the program curriculum with ABET curricular requirements (Criterion 5 and Program-Specific Criteria), sufficient quantity of qualified faculty to teach and to advise the students (Criterion 6), and sufficient space, equipment, software, library resources, and so on to support the program (Criteria 7 and 8).

Issues with compliance for each criterion are categorized as deficiency, weakness, or concern. A deficiency with any criterion means the program is not in compliance with ABET regulations and it will not be accredited. A weakness with any criterion indicates an issue with compliance that has to be addressed in the next two years. The program must document how the weaknesses were addressed in an interim self study report. The program may also be required to have an interim site visit, depending on the severity and number of weaknesses. A concern means the program is currently in compliance, but there exists the potential for future weaknesses or deficiencies. Concerns should be addressed before the next review cycle, and how those concerns were addressed should be highlighted in the next self study report, to ensure programs maintain compliance with all criteria.

B. Changes to the Curriculum

1. Changes in Response to Assessment and Changes in Standards for Engineering Programs

As noted in the Self Study in Table 12 and Table 13, course-level assessment showed students had deficiencies in mathematics and physics preparations. We have added a "C- or better" requirement on the calculus, physics, and electric circuits course requirements to address this issue. We are also currently working on knowledge tests that could be administered at the start of a term to identify deficiencies in prerequisite knowledge, so appropriate study materials can be provided to bring students up to the expected level of proficiency.

The deficiencies noted in CSUB's curriculum when compared to other CSU curriculums cannot be fully addressed unless engineering programs are given more overall units by the state legislature. Many of the other CSUs are legacy programs that are allowed to have more than 120 semester units or 180 quarter units. This gives them sufficient units to require courses such as MATLAB programming, additional circuitry courses, and differential equations, but we do not have such a luxury of units with the ECE programs. One possibility would be to have a combined linear algebra and differential equations course, but this will only be feasible when Mathematics has sufficient faculty to create such a course specifically for our programs.

Standards for ECE programs also change over time. The updated ACM/IEEE recommendations for Computer Engineering curriculum were released in late 2016 (the CE 2016 Body of Knowledge document). The new curriculum recommendations place more emphasis on cybersecurity and computer networking than the old recommendation. ABET may revise the program-specific curriculum requirements for Computer Engineering in response to these changes, as they have recently done with Computer Science in response to the 2013 curriculum updates for Computer Science. We are currently in the process of embedding cybersecurity topics in the CMPS courses taken by Computer Engineering students, but there are no units remaining to add a required course in computer networking. Should computer networking become an ABET program requirement, we will need to revise the CE curriculum in response.

General ABET requirements also change over time, so the department must constantly revise the programs in response to requirement changes in order to maintain compliance. ABET released new student learning outcomes (Criterion 3) and curriculum requirements (Criterion 5) for engineering programs in October 2017. We are currently revising our assessment plan to comply with these new SLOs and to develop a mapping between the old SLOs and new SLOs, so long-term trends in student proficiency can still be observed. We are already in compliance with the new curriculum requirements.

2. Changes Built on Program's Strengths

As stated in A. Program Goals for Next Seven Years, undergraduate research is a strength of the ECE programs. We have had many students participate in research projects and present their results at both undergraduate research venues and peer-reviewed venues. Building on this strength, we added the course ECE 4800 Undergraduate Research during the Q2S process and listed the course as one of the technical elective options for Computer Engineering and Electrical Engineering students.

3. Quarter-to-Semester Conversion

Extensive work was done during the Q2S process to ensure that the semester curriculum met all ABET requirements, aligned with the transfer Model Curriculum in Computer Engineering and in Electrical Engineering as listed on C-ID.net so transfer students could enter CSUB at the upper-division level, and was in-line with curricular expectations for CE and EE programs while still meeting the unit constraints (120 semester units overall and 60 semester units after transfer). Compromises had to be made to meet all of these constraints. For example, both programs removed the assembly language course (CMPS 224/2240) and the third physics course (PHYS 223/2230) under the semester requirements as neither of those courses are ABET requirements, both those courses are not part of the Model Curriculum, and requiring either of them would have taken the programs over 60 units after transfer.

Similar care was taken with the Q2S transition plans for students who started under the quarter-system to ensure that the transition plan would meet all ABET requirements for the number of units completed while also ensuring that students were not required to take an increased course load under semesters. Specific exceptions were made to the normal Q2S cognate transitions to meet this goal. For example, the general chemistry Q2S transition is normally CHEM 211/L (quarters) to CHEM 1000+1001 (semesters). However, CHEM 221/L is 5 quarter units while CHEM 1000 is 3 semester units and CHEM 1001 is 2 semester units. Requiring both the lecture course and the lab course under semesters would be going from 5 quarter units to 5 semester units, which is an increased course load for the students. So Electrical Engineering students who did not complete general chemistry under quarters only have to take the lecture section of general chemistry under semesters (CHEM 1000) and do not have to take the lab section.

Transition plans, 2013-15 catalog checklists with both quarter-system and semester-system course numbers, and detailed notes on the individual course Q2S transitions were posted on the department website so students could access the information during the transition. This information was also shared with the staff advisors at the NSME Student Center so they could develop each student's individual academic plan (IAP) for the transition.

C. Changes to Department Usage of Resources

The Program should evaluate whether its current offerings are the right mix going forward. Should some programs be placed on moratorium, discontinued, return from moratorium? Should new programs be developed?

The department has evaluated its ECE programs and has determined that they are the right mix going forward. We do not recommend any moratoriums for the ECE programs or new ECE programs at this time. We will continuously reevaluate specific curriculum issues as noted in the previous section.

Where might the department turn for external funding?

Department faculty have been active in seeking external funding to support their research programs. Besides the U.S. Department of Education grants that were used to start the engineering programs, faculty members have received research grants from the Department of Defense and National Science Foundation. Faculty members have also received curricular redesign grants and lab innovation grants from the Chancellor's Office. A summary of external funding awarded to ECE faculty is shown in Figure 17: External Funding to Support the ECE Area of the Department.

Providing additional professional development or research resources for faculty

Department faculty members are encouraged to make use of the professional development funds available through the Provost's Office and Faculty Teaching and Learning Center to support their travel to conferences and presentations. The NSME Dean's Office has identified funding that can be used for faculty professional development. Student researchers traveling to present have been primarily supported through new faculty start-up funds, grant funding, and campus travel funding for student researchers such as TSSR.

Adjusting faculty teaching loads and assigned/release time

Faculty members currently receive release time from new faculty release time, grant release time, service that comes with release time, campus release time programs (such as RCU), and NSME's release time policy for supervision of the undergraduate research course (ECE 4800). Faculty members are only eligible for release time for supervising ECE 4800 students if they have no other source of release time. In that situation, the faculty member earns the standard individual study rate of 1/3 WTU per student, for a maximum of 3 WTU in an academic year.

Implementing improved advising and support services to increase learning, retention, and/or graduation rates

Advising and support services for students is a collaboration between department faculty members and the staff advisors at the NSME Student Center. Currently, staff advisors handle freshman advising and intake

advising for transfer students, as well as questions on general education, academic petitions, and campus programs. Faculty advisors handle major and career advising for all remaining students.

The department makes a strong effort to remain in communication with the staff advisors. As faculty identify weaknesses, changes are suggested to the staff advisors. For example, transfer students are having difficulty adjusting to CSUB when they just have intake advising with their staff advisor, as they may not have had previous exposure to the Linux operating system used by the department. The department has requested that transfer students be sent over to the department after their intake advising appointment so that they can be introduced to the Linux OS and they can work through the tutorials posted on the department website before classes begin.

Advising effectiveness is also affected by the student-faculty ratio. Only tenured and tenure-track faculty members advise students. ECE students are primarily advised by four faculty members (Dr. Abdolee, Dr. Jafarzadeh, Dr. Li, and Dr. Vakilian) and the remaining five tenured and tenure-track faculty members advise the CMPS students. In the past three years, there have been 250-270 ECE students, so each of the four ECE advisors has approximately 65 advisees. The department is currently conducting a search for a fifth ECE faculty member as a replacement for an ECE faculty member who resigned. This hire will reduce the student-faculty advising ratio to approximately 50 advisees per faculty member. However, assuming 25 of those students seek advising each semester and each advising session lasts for 30 minutes, that is still 12.5 hours that will need to be devoted purely to advising during the two advising weeks, which is unrealistic in face of the time needed for teaching, research, and service during the advising period. As ECE enrollments continue to grow, the time needed for proper and effective advising would increase proportionally.

The ECE/ENGR 1618 + 1628 Introduction to Engineering first-year seminar sequence also supports CSUB freshmen. This course is co-taught between CEE/CS and Physics & Engineering. It provides not only an introduction to CSUB, but it also gives students a broad introduction and overview of the engineering discipline. Students work on a variety of hands-on projects such as miniature trebuchets, air-powered model cars, model engines, and so on to keep them active and engaged in the learning process. This engagement is particularly important to retention in the first year, when engineering freshman may have difficulty with the calculus and physics cognate courses and might otherwise consider changing majors due to the difficulty of the subject matter.

Assignment of faculty to teach specific courses or sections

With respects to course assignment, some courses are highly specialized and faculty members are assigned to teach those courses based on their primary and secondary specialty areas. For example, a faculty member who specializes in power systems would not teach the digital communications course. Every faculty member submits a list of courses they are qualified to teach and a list of courses they are not qualified to teach to the department chair. Every course has at least two faculty members who could teach that course.

Changing the scheduling of certain courses or the frequency with which they are offered

Scheduling of courses depends upon student demand and on department budget. All core ECE courses are offered at least once per year and all electives are offered on a two-year rotation. Core courses which are only required by either Computer Engineering or Electrical Engineering typically have a large lecture and multiple lab sections once a year to meet demand. Both programs require ECE 3040 Signals and Systems and ECE 3070 Analog Circuits. ECE 3040 and 3070 are bottleneck courses, as they are prerequisites to other required ECE courses, so they are offered every semester. Other courses which are required by both majors may have an additional section added in the “off-schedule” semester (e.g. in Spring if the course is typically offered in Fall) if the waitlists are high enough and there is sufficient budget to teach that section.

Changing the number of students required in course sections so that student learning and effectiveness of teaching are maximized

The number of students per lab section is constrained by the space and equipment available in each lab. For

example, EC II 201 only has enough power systems equipment to accommodate 20 students per lab section even though the room has high square footage, while the SCI III 309 lab room can only safely hold 20 students due to the small size of the room. The number of students per lecture section depends on the number of lab sections associated with that lecture section.

How can resources within the department be allocated in such a way as to better achieve the mission and goals of the department?

The department already makes very efficient use of its resources. The original estimates for creation of the Computer Engineering and Electrical Engineering programs, as outlined in their respective proposals, was that the department would need five new ECE faculty members, plus Dr. Wei Li who was an existing faculty member in ECE, to support approximately 225 ECE students. In actuality, we have only hired four new ECE faculty members to support over 250 ECE students (note: we are currently looking for a replacement for one of these four faculty lines, with a full-time lecturer covering the teaching load in the meanwhile; the replacement hire will begin in Fall 2018).

The proposals estimated that the total ECE faculty salary costs would be close to $550,000 while our actual ECE faculty salary costs are approximately $425,000. This salary savings is due to not hiring the fifth new line in engineering that was outlined in the proposals. However, this cost-savings measure has cost the department by creating higher student-faculty ratios for advising and by limiting the pool of expertise available in electrical and computer engineering for teaching and research. This could also impact our compliance with ABET's Criterion 6 requirement, which is as follows:

> The program must demonstrate that the faculty members are of sufficient number and they have the competencies to cover all of the curricular areas of the program. There must be sufficient faculty to accommodate adequate levels of student-faculty interaction, student advising and counseling, university service activities, professional development, and interactions with industrial and professional practitioners, as well as employers of students.

The department has also created a space plan to maximize the efficient use of department space as part of the overall NSME space planning effort. The CMPS computer labs are used as much as possible for CMPS lectures and programming labs and are also used for lectures and presentations for the ECE 4910 + 4928 Senior Project sequence. There are no pure teaching ECE labs, as all labs used for ECE classes are also used for research between classes.

As an example of how the space plan helps maximize the use of department space, the circuits lab, SCI III 313, is also used for Introduction to Engineering as it is the largest department-controlled lab which does not have highly specialized, expensive equipment. This means there is sufficient space for the Introduction to Engineering projects and less concern about accidental damage. SCI III 313 is also set up to support medium-sized lectures, so if there is a course with a single lab section in SCI III 309 (which is not suitable for lecturing), its lecture section is scheduled in SCI III 313.

Our space plan also considers reallocating spaces to better reflect the needs of the department. One engineering lab, SCI III 328, is rarely used by courses but is frequently used by research students. So it will be converted to a research space in 2018/19 which will be shared by three faculty members in the department. The department also shares lab spaces with other departments. One research lab and one teaching lab are shared between CEE/CS and Physics & Engineering, while another research lab is shared between CEE/CS and Biology.

D. Request for Additional Resources

The highest-priority request for the ECE programs is an expansion line in Computer Engineering. As noted in previous sections, most of the ECE faculty members have Electrical Engineering degrees and specialty areas, so we are deficient in faculty who specialize in traditional Computer Engineering areas such as circuitry and electronics. The student-faculty advising ratio is also high, making it unrealistic to advise even half of one's assigned advisees every semester during the advising period. As ECE enrollments continue to grow, this will only worsen. The initial proposals for the ECE programs and the previous MOUAP for the department also outlined one additional new faculty line for the ECE programs that was never authorized for hiring.

Another concern with the growth of the ECE programs is the demand for upper-division ECE courses. As noted in Figure 12: Full-Time Equivalent ECE Students by Class Level and Academic Year, while the headcount of ECE majors experienced a slight "semester dip" in 2016/17, the FTES has only continued to grow, particularly for upper-division ECE courses. This is expected as freshmen students admitted in previous years must spend at least two years completing their cognates in calculus, physics, and lower-division electric circuits before they can begin upper-division ECE coursework. Additionally, transfer students who complete the Model Curriculum at a community college enter CSUB ready to take upper-division coursework. As shown in Figure 8: ECE Degrees Awarded by Year and Admission Type, upper-division transfer students account for about half of our graduates since the beginning of both programs, so this is a large source of student demand for upper-division courses. It is difficult to find qualified part-time lecturers to teach upper-division ECE courses, so an expansion line in Computer Engineering will help us meet this anticipated demand.

This expansion line will only help to meet current demand. As noted in Figure 11: Enrollment Trends and Projections for Computer Engineering and Electrical Engineering, the number of Electrical Engineering majors is still in a growth phase. We also anticipate greater demand for the programs once we complete ABET accreditation. Should the student demand continue to rise as expected, additional ECE faculty members will be needed over the next seven years.

Also, while our department space plan has helped us maximize the use of our existing lab spaces in the short-term, in the long-term, as ECE enrollments continue to grow, we will need additional space for the programs. Most of the ECE labs are both research and teaching spaces in the current space plan. As those labs are used more frequently for courses, research space will be needed elsewhere. If the proposed EEIC building is funded and built within the next five to seven years, we will need space in that building for research and/or teaching labs.

Office space is another constraint in our department space plan. We currently have sufficient office space to give every tenured and tenure-track faculty member their own office, including the new hires who will begin in Fall 2018. Most of the full-time lecturers also have their own office, although one full-time lecturer shares an office with a part-time lecturer. All other part-time lectures share the same office. In the short-term, we have worked with the NSME Dean's Office to identify space that can be temporarily used for additional office space. In the long-term, when EEIC is built and Physics & Engineering moves their offices over to EEIC, we will need the office space vacated by P&E to support the ECE and CMPS programs.

III. Appendices

A. Academic Program Data Profile

The following is the 2016-17 Academic Program Data Profile for the Computer and Electrical Engineering Department. High-quality charts and images can be accessed through the Tableau website maintained by IRPA.

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

Use this drop-down menu to select the Program you would like to view throughout all the visualizations in this workbook.

Computer Science, Computer & Electrical Engineering

Note: CSU Bakersfield converted to a Semester system in the Fall 2016 semester and experienced a drop in overall FTES as a result. Keep this in mind while reviewing the five year trends included in this document.

Please note: Some programs, or sections of a program, may not have 5 years of data available. This may affect the 5-year average calculation presented.

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

I. Faculty and Instructional Cost, Academic Year

		2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
		FTEF	% Total FTEF	FTEF	% Total FTEF	FTEF	% Total FTEF	FTEF	% Total FTEF	FTEF	% Total FTEF	
Faculty	Tenured Faculty	5.00	44.8%	5.00	38.0%	4.00	28.0%	2.00	16.0%	2.00	13.9%	3.60
	Tenure-Track Faculty	3.00	26.9%	3.00	22.8%	3.00	21.0%	4.00	31.9%	6.00	41.6%	3.80
	FERP Faculty	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.50	4.0%	0.50	3.5%	0.20
	Total	**8.00**	**71.6%**	**8.00**	**60.7%**	**7.00**	**49.0%**	**6.50**	**51.9%**	**8.50**	**58.9%**	**7.60**
Lecturers	Full-Time Lecturer	1.00	9.0%	1.00	7.6%	5.00	35.0%	2.00	16.0%	4.00	27.7%	2.60
	Part-Time Lecturer	2.17	19.4%	4.17	31.7%	2.29	16.0%	4.02	32.1%	1.93	13.4%	2.92
	Total	**3.17**	**28.4%**	**5.17**	**39.3%**	**7.29**	**51.0%**	**6.02**	**48.1%**	**5.93**	**41.1%**	**5.52**
Total Academic Year FTEF		**11.17**	**100.0%**	**13.17**	**100.0%**	**14.29**	**100.0%**	**12.52**	**100.0%**	**14.43**	**100.0%**	**13.12**

Salary Information

		2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
Faculty	Tenured Faculty	519,456	67.9%	524,256	67.9%	424,574	61.6%	197,868	32.4%	212,208	26.4%	$375,672
	Tenure-Track Faculty	245,016	32.1%	247,896	32.1%	264,687	38.4%	360,264	58.9%	535,632	66.5%	$330,699
	FERP Faculty	0	0.0%	0	0.0%	0	0.0%	53,400	8.7%	57,192	7.1%	$22,118
	Total	**764,472**	**100.0%**	**772,152**	**100.0%**	**689,261**	**100.0%**	**611,532**	**100.0%**	**805,032**	**100.0%**	**$728,490**
Lecturers	Full-Time Lecturer	83,940	48.9%	86,568	32.3%	311,038	75.1%	132,552	41.5%	230,424	69.5%	$168,904
	Part-Time Lecturer	87,623	51.1%	181,586	67.7%	103,334	24.9%	186,989	58.5%	101,300	30.5%	$132,166
	Total	**171,563**	**100.0%**	**268,154**	**100.0%**	**414,372**	**100.0%**	**319,541**	**100.0%**	**331,724**	**100.0%**	**$301,071**
Total AY Instructional Cost		**936,035**	**100.0%**	**1,040,306**	**100.0%**	**1,103,633**	**100.0%**	**931,073**	**100.0%**	**1,136,756**	**100.0%**	**$1,029,561**

Instructional Cost Indicators

	2012/13		2013/14		2014/15		2015/16		2016/17		Avg	
	N	%	N	%	N	%	N	%	N	%	N	%
Cost per Academic Year FTES	$4,832	112.2%	$4,852	112.7%	$4,443	103.2%	$3,338	77.5%	$4,379	101.7%	**$4,307**	**100.0%**

	2012/13		2013/14		2014/15		2015/16		2016/17		Avg	
	N	%	N	%	N	%	N	%	N	%	N	%
Cost Per Stateside Degrees Award..	49,265	100.0%	31,524	100.0%	26,918	100.0%	17,242	100.0%	19,730	100.0%	**25,284**	**100.0%**

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

II. Faculty and Instructional Cost, Summer

		2016/17		5 Yr Avg
		FTEF	% Total FTEF	
Faculty	Tenure-Track Faculty	0.00	0.0%	0.00
	Tenured Faculty	0.00	0.0%	0.00
	Total	**0.00**	**0.0%**	**0.00**
Lecturers	Full-Time Lecturer	0.40	100.0%	0.08
	Part-Time Lecturer	0.00	0.0%	0.00
	Total	**0.40**	**100.0%**	**0.08**
Total Summer FTEF		**0.40**	**100.0%**	**0.08**

Salary Information

		2016/17		5 Yr Avg	
		N	%	N	%
Faculty	Tenured Faculty	$0		$0	
	Tenure-Track Faculty	$0		$0	
	Total	**$0**		**$0**	
Lecturers	Full-Time Lecturer	$5,754	100.0%	$1,151	100.0%
	Part-Time Lecturer	$0	0.0%	$0	0.0%
	Total	**$5,754**	**100.0%**	**$1,151**	**100.0%**
Total Summer Instructional Cost		**$5,754**	**100.0%**	**$1,151**	**100.0%**

Instructional Cost Indicators

	2016/17		Avg	
	N	%	N	%
Cost per Summer FTES	$2,877	100.0%	**$2,877**	**100.0%**

III. Chair Administrative Release Time, College Year

	2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
	N	%	N	%	N	%	N	%	N	%	
Program Chair's Administrative Fraction	0.61	100.0%	0.67	100.0%	0.50	100.0%	0.50	100.0%	0.50	100.0%	0.56

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

IV. Majors in the Program (Fall Term Only)

Majors by Student Level

	Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
	N	%	N	%	N	%	N	%	N	%	
Undergraduate	237	12.6%	302	16.0%	357	18.9%	479	25.4%	509	27.0%	376.8
Postbac (2nd Bachelors)	6	9.8%	11	18.0%	11	18.0%	14	23.0%	19	31.1%	12.2
Postbac (Credential/No Degree)	1	25.0%	1	25.0%	1	25.0%	1	25.0%			0.8
Total Majors	244	12.5%	314	16.1%	369	18.9%	494	25.3%	528	27.1%	389.8

% of All CSUB Declared Majors

	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	5 Yr Avg
Undergraduate	3%	4%	5%	6%	6%	5.0%
Postbac (2nd Bachelors)	*	*	*	*	*	
Postbac (Credential/No Degree)	*	*	*	*	0%	
Grand Total	3%	4%	5%	6%	7%	5.1%

Majors by Student Level - Details

		Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
Computer Engineering	Undergraduate	79	98.8%	105	98.1%	117	97.5%	130	97.7%	123	98.4%	110.8
	Postbac (2nd Bachelors)	1	1.3%	2	1.9%	3	2.5%	3	2.3%	2	1.6%	2.2
	Total	80	100.0%	107	100.0%	120	100.0%	133	100.0%	125	100.0%	113.0
Computer Science	Undergraduate	144	96.0%	154	96.3%	177	96.7%	237	96.0%	260	95.2%	194.4
	Postbac (2nd Bachelors)	5	3.3%	6	3.8%	6	3.3%	10	4.0%	13	4.8%	8.0
	Postbac (Credential/No Degree)	1	0.7%									0.2
	Total	150	100.0%	160	100.0%	183	100.0%	247	100.0%	273	100.0%	202.6
Electrical Engineering	Undergraduate	14	100.0%	43	91.5%	63	95.5%	112	98.2%	126	96.9%	71.6
	Postbac (2nd Bachelors)			3	6.4%	2	3.0%	1	0.9%	4	3.1%	2.0
	Postbac (Credential/No Degree)			1	2.1%	1	1.5%	1	0.9%			0.6
	Total	14	100.0%	47	100.0%	66	100.0%	114	100.0%	130	100.0%	74.2
Grand Total		244	100.0%	314	100.0%	369	100.0%	494	100.0%	528	100.0%	389.8

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

Majors by Campus

		Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
Undergraduate	Bakersfield Campus	236.0	99.6%	301.0	99.7%	356.0	99.7%	477.0	99.6%	508.0	99.8%	375.6
	AV Campus	1.0	0.4%	1.0	0.3%	1.0	0.3%	2.0	0.4%	1.0	0.2%	1.2
	Total	237.0	100.0%	302.0	100.0%	357.0	100.0%	479.0	100.0%	509.0	100.0%	376.8
Postbac (2nd Bachelors)	Bakersfield Campus	6.0	100.0%	11.0	100.0%	11.0	100.0%	14.0	100.0%	19.0	100.0%	12.2
	Total	6.0	100.0%	11.0	100.0%	11.0	100.0%	14.0	100.0%	19.0	100.0%	12.2
Postbac (Credential/No Degr..	Bakersfield Campus	1.0	100.0%	1.0	100.0%	1.0	100.0%	1.0	100.0%			0.8
	Total	1.0	100.0%	1.0	100.0%	1.0	100.0%	1.0	100.0%			0.8
Grand Total		244.0	100.0%	314.0	100.0%	369.0	100.0%	494.0	100.0%	528.0	100.0%	389.8

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

Majors by Campus - Details

			Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
			N	%	N	%	N	%	N	%	N	%	
Computer Engineering	Undergraduate	Bakersfield Campus	79.0	100.0%	105.0	100.0%	117.0	100.0%	130.0	100.0%	123.0	100.0%	110.8
		Total	79.0	100.0%	105.0	100.0%	117.0	100.0%	130.0	100.0%	123.0	100.0%	110.8
	Postbac (2nd Bachelors)	Bakersfield Campus	1.0	100.0%	2.0	100.0%	3.0	100.0%	3.0	100.0%	2.0	100.0%	2.2
		Total	1.0	100.0%	2.0	100.0%	3.0	100.0%	3.0	100.0%	2.0	100.0%	2.2
	Total		80.0	100.0%	107.0	100.0%	120.0	100.0%	133.0	100.0%	125.0	100.0%	113.0
Computer Science	Undergraduate	Bakersfield Campus	143.0	99.3%	153.0	99.4%	176.0	99.4%	235.0	99.2%	260.0	100.0%	193.4
		AV Campus	1.0	0.7%	1.0	0.6%	1.0	0.6%	2.0	0.8%			1.0
		Total	144.0	100.0%	154.0	100.0%	177.0	100.0%	237.0	100.0%	260.0	100.0%	194.4
	Postbac (2nd Bachelors)	Bakersfield Campus	5.0	100.0%	6.0	100.0%	6.0	100.0%	10.0	100.0%	13.0	100.0%	8.0
		Total	5.0	100.0%	6.0	100.0%	6.0	100.0%	10.0	100.0%	13.0	100.0%	8.0
	Postbac (Credential/No Degree)	Bakersfield Campus	1.0	100.0%									0.2
		Total	1.0	100.0%									0.2
	Total		150.0	100.0%	160.0	100.0%	183.0	100.0%	247.0	100.0%	273.0	100.0%	202.6
Electrical Engineering	Undergraduate	Bakersfield Campus	14.0	100.0%	43.0	100.0%	63.0	100.0%	112.0	100.0%	125.0	99.2%	71.4
		AV Campus									1.0	0.8%	0.2
		Total	14.0	100.0%	43.0	100.0%	63.0	100.0%	112.0	100.0%	126.0	100.0%	71.6
	Postbac (2nd Bachelors)	Bakersfield Campus			3.0	100.0%	2.0	100.0%	1.0	100.0%	4.0	100.0%	2.0
		Total			3.0	100.0%	2.0	100.0%	1.0	100.0%	4.0	100.0%	2.0
	Postbac (Credential/No Degree)	Bakersfield Campus			1.0	100.0%	1.0	100.0%	1.0	100.0%			0.6
		Total			1.0	100.0%	1.0	100.0%	1.0	100.0%			0.6
	Total		14.0	100.0%	47.0	100.0%	66.0	100.0%	114.0	100.0%	130.0	100.0%	74.2
Grand Total			244.0	100.0%	314.0	100.0%	369.0	100.0%	494.0	100.0%	528.0	100.0%	389.8

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

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Majors by Enrollment Status

		Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
Undergraduate	Continuing Students	149.0	61.1%	197.0	62.7%	244.0	66.1%	297.0	60.1%	372.0	70.5%	251.8
	First-Time Students	65.0	26.6%	77.0	24.5%	75.0	20.3%	121.0	24.5%	88.0	16.7%	85.2
	New Transfers	21.0	8.6%	24.0	7.6%	34.0	9.2%	55.0	11.1%	43.0	8.1%	35.4
	Returning Students	2.0	0.8%	4.0	1.3%	4.0	1.1%	6.0	1.2%	6.0	1.1%	4.4
	Total	237.0	97.1%	302.0	96.2%	357.0	96.7%	479.0	97.0%	509.0	96.4%	376.8
Postbac (2nd Bachelors)	Continuing Students	5.0	2.0%	7.0	2.2%	6.0	1.6%	9.0	1.8%	12.0	2.3%	7.8
	First-Time Students	1.0	0.4%	4.0	1.3%	5.0	1.4%	5.0	1.0%	7.0	1.3%	4.4
	Total	6.0	2.5%	11.0	3.5%	11.0	3.0%	14.0	2.8%	19.0	3.6%	12.2
Postbac (Credential/No Degree)	Continuing Students	1.0	0.4%	1.0	0.3%	1.0	0.3%	1.0	0.2%			0.8
	Total	1.0	0.4%	1.0	0.3%	1.0	0.3%	1.0	0.2%			0.8
Grand Total		244.0	100.0%	314.0	100.0%	369.0	100.0%	494.0	100.0%	528.0	100.0%	389.8

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

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Majors by Enrollment Status - Details

			Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
			N	%	N	%	N	%	N	%	N	%	
Computer Engineering	Undergraduate	Continuing Students	42.0	17.2%	66.0	21.0%	73.0	19.8%	72.0	14.6%	87.0	16.5%	68.0
		First-Time Students	28.0	11.5%	32.0	10.2%	33.0	8.9%	45.0	9.1%	29.0	5.5%	33.4
		New Transfers	8.0	3.3%	5.0	1.6%	11.0	3.0%	11.0	2.2%	4.0	0.8%	7.8
		Returning Students	1.0	0.4%	2.0	0.6%			2.0	0.4%	3.0	0.6%	1.6
		Total	79.0	32.4%	105.0	33.4%	117.0	31.7%	130.0	26.3%	123.0	23.3%	110.8
	Postbac (2nd Bachelors)	Continuing Students	1.0	0.4%			2.0	0.5%	2.0	0.4%	1.0	0.2%	1.2
		First-Time Students			2.0	0.6%	1.0	0.3%	1.0	0.2%	1.0	0.2%	1.0
		Total	1.0	0.4%	2.0	0.6%	3.0	0.8%	3.0	0.6%	2.0	0.4%	2.2
	Total		80.0	32.8%	107.0	34.1%	120.0	32.5%	133.0	26.9%	125.0	23.7%	113.0
Computer Science	Undergraduate	Continuing Students	102.0	41.8%	109.0	34.7%	128.0	34.7%	160.0	32.4%	190.0	36.0%	137.8
		First-Time Students	31.0	12.7%	30.0	9.6%	28.0	7.6%	41.0	8.3%	42.0	8.0%	34.4
		New Transfers	10.0	4.1%	13.0	4.1%	18.0	4.9%	33.0	6.7%	26.0	4.9%	20.0
		Returning Students	1.0	0.4%	2.0	0.6%	3.0	0.8%	3.0	0.6%	2.0	0.4%	2.2
		Total	144.0	59.0%	154.0	49.0%	177.0	48.0%	237.0	48.0%	260.0	49.2%	194.4
	Postbac (2nd Bachelors)	Continuing Students	4.0	1.6%	4.0	1.3%	3.0	0.8%	6.0	1.2%	8.0	1.5%	5.0
		First-Time Students	1.0	0.4%	2.0	0.6%	3.0	0.8%	4.0	0.8%	5.0	0.9%	3.0
		Total	5.0	2.0%	6.0	1.9%	6.0	1.6%	10.0	2.0%	13.0	2.5%	8.0
	Postbac (Credential/No Degr..	Continuing Students	1.0	0.4%									0.2
		Total	1.0	0.4%									0.2
	Total		150.0	61.5%	160.0	51.0%	183.0	49.6%	247.0	50.0%	273.0	51.7%	202.6
Electrical Engineering	Undergraduate	Continuing Students	5.0	2.0%	22.0	7.0%	43.0	11.7%	65.0	13.2%	95.0	18.0%	46.0
		First-Time Students	6.0	2.5%	15.0	4.8%	14.0	3.8%	35.0	7.1%	17.0	3.2%	17.4
		New Transfers	3.0	1.2%	6.0	1.9%	5.0	1.4%	11.0	2.2%	13.0	2.5%	7.6
		Returning Students					1.0	0.3%	1.0	0.2%	1.0	0.2%	0.6
		Total	14.0	5.7%	43.0	13.7%	63.0	17.1%	112.0	22.7%	126.0	23.9%	71.6
	Postbac (2nd Bachelors)	Continuing Students			3.0	1.0%	1.0	0.3%	1.0	0.2%	3.0	0.6%	1.6
		First-Time Students					1.0	0.3%			1.0	0.2%	0.4
		Total			3.0	1.0%	2.0	0.5%	1.0	0.2%	4.0	0.8%	2.0
	Postbac (Credential/No Degr..	Continuing Students			1.0	0.3%	1.0	0.3%	1.0	0.2%			0.6
		Total			1.0	0.3%	1.0	0.3%	1.0	0.2%			0.6
	Total		14.0	5.7%	47.0	15.0%	66.0	17.9%	114.0	23.1%	130.0	24.6%	74.2
Grand Total			244.0	100.0%	314.0	100.0%	369.0	100.0%	494.0	100.0%	528.0	100.0%	389.8

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

V. Degrees in the Program

Degrees by Level

	2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
	N	%	N	%	N	%	N	%	N	%	
First Bachelors	19.00	95.0%	30.00	90.9%	40.00	97.6%	52.00	96.3%	53.00	100.0%	38.8
Second Bachelors	1.00	5.0%	3.00	9.1%	1.00	2.4%	2.00	3.7%			1.4
Total Degrees Awarded	20.00	100.0%	33.00	100.0%	41.00	100.0%	54.00	100.0%	53.00	100.0%	40.2

% of All CSUB Degrees Awarded

	2012/13	2013/14	2014/15	2015/16	2016/17	5 Yr Avg
First Bachelors	1%	2%	3%	3%	3%	2.5%
Second Bachelors	5%	13%	4%	11%		7.4%
Total Degrees Awarded	1%	2%	3%	3%	3%	2.5%

Degrees by Student Level - Details

		2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
Computer Engine..	First Bachelors	2.00	66.7%	4.00	100.0%	9.00	100.0%	9.00	100.0%	9.00	100.0%	6.6
	Second Bachelors	1.00	33.3%									0.2
	Total	3.00	100.0%	4.00	100.0%	9.00	100.0%	9.00	100.0%	9.00	100.0%	6.8
Computer Science	First Bachelors	17.00	100.0%	21.00	91.3%	24.00	96.0%	33.00	94.3%	26.00	100.0%	24.2
	Second Bachelors			2.00	8.7%	1.00	4.0%	2.00	5.7%			1.0
	Total	17.00	100.0%	23.00	100.0%	25.00	100.0%	35.00	100.0%	26.00	100.0%	25.2
Electrical Engine..	First Bachelors			5.00	83.3%	7.00	100.0%	10.00	100.0%	18.00	100.0%	8.0
	Second Bachelors			1.00	16.7%							0.2
	Total			6.00	100.0%	7.00	100.0%	10.00	100.0%	18.00	100.0%	8.2
Total Degrees Awarded		20.00	100.0%	33.00	100.0%	41.00	100.0%	54.00	100.0%	53.00	100.0%	40.2

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

Degrees by Campus

		2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
First Bachelors	Bakersfield Campus	19.00	100.0%	30.00	100.0%	40.00	100.0%	51.00	98.1%	53.00	100.0%	38.6
	Antelope Valley Cam..							1.00	1.9%			0.2
	Total	19.00	100.0%	30.00	100.0%	40.00	100.0%	52.00	100.0%	53.00	100.0%	38.8
Second Bachelors	Bakersfield Campus	1.00	100.0%	3.00	100.0%	1.00	100.0%	2.00	100.0%			1.4
	Total	1.00	100.0%	3.00	100.0%	1.00	100.0%	2.00	100.0%			1.4
Total Degrees Awarded		20.00	100.0%	33.00	100.0%	41.00	100.0%	54.00	100.0%	53.00	100.0%	40.2

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

Degrees by Campus - Details

			2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
			N	%	N	%	N	%	N	%	N	%	
Computer Engin..	First Bachelors	Bakersfield Campus	2.00	100.0%	4.00	100.0%	9.00	100.0%	9.00	100.0%	9.00	100.0%	6.6
		Total	2.00	100.0%	4.00	100.0%	9.00	100.0%	9.00	100.0%	9.00	100.0%	6.6
	Second Bachelors	Bakersfield Campus	1.00	100.0%									0.2
		Total	1.00	100.0%									0.2
	Total		3.00	100.0%	4.00	100.0%	9.00	100.0%	9.00	100.0%	9.00	100.0%	6.8
Computer Science	First Bachelors	Bakersfield Campus	17.00	100.0%	21.00	100.0%	24.00	100.0%	32.00	97.0%	26.00	100.0%	24.0
		Antelope Valley Ca..							1.00	3.0%			0.2
		Total	17.00	100.0%	21.00	100.0%	24.00	100.0%	33.00	100.0%	26.00	100.0%	24.2
	Second Bachelors	Bakersfield Campus			2.00	100.0%	1.00	100.0%	2.00	100.0%			1.0
		Total			2.00	100.0%	1.00	100.0%	2.00	100.0%			1.0
	Total		17.00	100.0%	23.00	100.0%	25.00	100.0%	35.00	100.0%	26.00	100.0%	25.2
Electrical Engin..	First Bachelors	Bakersfield Campus			5.00	100.0%	7.00	100.0%	10.00	100.0%	18.00	100.0%	8.0
		Total			5.00	100.0%	7.00	100.0%	10.00	100.0%	18.00	100.0%	8.0
	Second Bachelors	Bakersfield Campus			1.00	100.0%							0.2
		Total			1.00	100.0%							0.2
	Total				6.00	100.0%	7.00	100.0%	10.00	100.0%	18.00	100.0%	8.2
Total Degrees Awarded			20.00	100.0%	33.00	100.0%	41.00	100.0%	54.00	100.0%	53.00	100.0%	40.2

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

VI. Student Success Outcomes

First-Time Freshmen On Track for Graduation in 4 Years

(Based on Completion of Non-Remedial Units)

	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016
Fall Cohort Size	65	77	75	121	88
Cohort Persisting & Completing Freshman Year Units in Year 1	12	14	6	17	^
% of Cohort, Year 1	18%	18%	8%	14%	^
Cohort Persisting & Completing Sophomore Year Units in Year 2	6	5	^	10	
% of Cohort, Year 2	9%	6%	^	8%	
Cohort Persisting & Completing Junior Year Units in Year 3	6	5	^		
% of Cohort, Year 3	9%	6%	^		

Rate of Degrees Awarded per 100 Program FTES Taught

	2012/13	2013/14	2014/15	2015/16	2016/17
First Bachelor's Degrees per 100 Undergraduate FTES Taught in College Year	9.8	14.0	16.1	18.6	22.0
First Master's Degrees per 100 Graduate FTES Taught in College Year	0.0	0.0	0.0	0.0	0.0

Rate of Degrees Awarded Per At-Risk FTF Majors

	Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016	
	At Risk	%	At Risk	%	At Risk	%	At Risk	%	At Risk	%
First-Time Freshmen Needing Remediation in Both Math & English	16.00	100.0%	14.00	100.0%	17.00	100.0%	17.00	100.0%	14.00	100.0%

	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016
First Bachelor's Degrees Awarded in College Year per At-Risk Majors in Fall Term	3.54	4.25	3.98	3.98	5.06

^ indicates a grouping of fewer than 5 students

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

VI. Graduation Rates and Time-to-Degree

Students Who Had a(n) Computer Science, Computer & Electrical Engineering Major At Matriculation

		Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011
First-Time Freshmen	Cohort Size	21	24	34	32	36
	% Graduated in Same Program as Matriculation Program in 6 Years	14%	13%	18%	9%	8%
	% Graduated in Any Program in 6 Years	48%	21%	26%	22%	53%
Upper-Division Transfer Students	Cohort Size	9	^	9	15	21
	% Graduated in Same Program as Matriculation Program in 6 Years	44%	^	33%	33%	24%
	% Graduated in Any Program in 6 Years	78%	^	33%	47%	57%

Students Who Had a(n) Computer Science, Computer & Electrical Engineering Major During Their Junior Year

		Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011
First-Time Freshmen	Cohort Size	10	13	16	16	24
	% Graduated in Same Program as Junior Year in 6 Years	40%	31%	44%	50%	46%
	% Graduated in Any Program in 6 Years	60%	38%	63%	56%	50%
Upper-Division Transfer Students	Cohort Size	9	^	9	15	21
	% Graduated in Same Program as Junior Year in 6 Years	44%	^	33%	33%	24%
	% Graduated in Any Program in 6 Years	78%	^	33%	47%	57%

CSUB Median Time-To-Degree

	3 Year N	3 Year Median TTD	5 Year N	5 Year Median TTD
First-Time Freshmen	1,715	4.71	3,326	4.71
Lower-Division Transfer Students	437	3.29	1,115	3.29
Upper-Division Transfer Students	2,276	2.21	5,585	2.29
Graduate Students	771	1.75	1,892	1.99

Natural Sciences, Mathematics and Engineering Median Time-to-Degree

	3 Year N	3 Year Median TTD	5 Year N	5 Year Median TTD
First-Time Freshmen	406	4.75	695	4.75
Lower-Division Transfer Students	100	4.29	198	3.99
Upper-Division Transfer Students	406	2.75	1,076	2.53
Graduate Students	77	2.29	144	2.54

Computer Science, Computer & Electrical Engineering Median Time-to-Degree

	3 Year N	3 Year Median TTD	5 Year N	5 Year Median TTD
First-Time Freshmen	62	4.75	85	4.96
Lower-Division Transfer Students	12	4.98	21	4.24
Upper-Division Transfer Students	65	2.75	102	2.75

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

Computer Science, Computer & Electrical Engineering Median Time to Degree - Details

		3 Year N	3 Year Median TTD	5 Year N	5 Year Median TTD
Computer Engineering	First-Time Freshmen	10	4.75	11	4.75
	Lower-Division Transfer Students	^	^	^	^
	Upper-Division Transfer Students	11	3.17	14	3.17
Computer Science	First-Time Freshmen	36	4.75	57	5.29
	Lower-Division Transfer Students	9	5.45	17	3.75
	Upper-Division Transfer Students	36	2.85	66	2.97
Electrical Engineering	First-Time Freshmen	16	4.86	17	4.75
	Upper-Division Transfer Students	18	1.99	22	1.99

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

VIII. Student/Faculty Ratio

Academic Year Student-Faculty Ratio Calculated by CSUB

	2012/13	2013/14	2014/15	2015/16	2016/17	Avg
Student-Faculty R..	17.3	16.3	17.4	22.3	17.8	18.2

Fall Term Student-Faculty Ratio From Chancellor's Office Data

	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Avg
CSU Bakersfield	21.6	25.6	20.6	25.6	19.1	22.3
CSU Systemwide	21.6	23.3	22.6	23.9	24.1	23.2

All Average Class Size

	2012/13	2013/14	2014/15	2015/16	2016/17
Major Classes	21	23	25	26	0
GE Classes	43	41	41	42	42
Service Classes	32	36	39	40	35
Developmental Classes	17	14	14	16	20
Graduate Classes	14	7	11	11	0
Graduate or Postbac Classes	0	0	0	0	9
Major or Concentr Classes	0	0	0	0	21

IX. Average Class Size & Class Format

Computer Science, Computer & Electrical Engineering Average Class Size

	2012/13	2013/14	2014/15	2015/16	2016/17
Major Classes	24	27	28	34	0
Major or Concentr Classes	0	0	0	0	26

Computer Science, Computer & Electrical Engineering Sections Offered by Class Format

	2012/13		2013/14		2014/15		2015/16		2016/17	
	N	%	N	%	N	%	N	%	N	%
Face-to-Face	120	82%	118	77%	129	81%	131	86%	139	96%
Hybrid	2	1%	4	3%	9	6%	0	0%	0	0%
Independent Study	23	16%	30	20%	22	14%	21	14%	6	4%
Online Only	1	1%	1	1%	0	0%	0	0%	0	0%
Total Sections	146	100%	153	100%	160	100%	152	100%	145	100%

Natural Sciences, Mathematics and Engineering Sections offered by Class Format

	2012/13		2013/14		2014/15		2015/16		2016/17	
	N	%	N	%	N	%	N	%	N	%
Face-to-Face	853	71%	871	70%	952	74%	953	73%	995	88%
Hybrid	88	7%	95	8%	100	8%	91	7%	6	1%
Independent Study	248	21%	261	21%	205	16%	244	19%	117	10%
ITV	3	0%	3	0%	2	0%	3	0%	2	0%
Online Only	8	1%	15	1%	23	2%	16	1%	17	1%
Total Sections	1,200	100%	1,245	100%	1,282	100%	1,307	100%	1,137	100%

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

X. Full-Time Equivalent Students (FTES) by Course Level

	2012/13	2013/14	2014/15	2015/16	2016/17	5 Yr Avg
Developmental FTES	0.0	0.0	0.0	0.0	0.0	0.0
Lower Division FTES	108.6	113.8	131.4	137.7	128.6	124.0
Upper Division FTES	85.0	100.2	116.9	141.2	112.2	111.1
Graduate FTES	0.1	0.3	0.1	0.0	0.0	0.1
Total FTES by Course Level	193.7	214.3	248.4	278.9	240.8	235.2

	2012/13	2013/14	2014/15	2015/16	2016/17	5 Yr Avg
% Developmental FTES	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Lower Division FTES	56.1%	53.1%	52.9%	49.4%	53.4%	52.7%
% Upper Division FTES	43.9%	46.8%	47.1%	50.6%	46.6%	47.2%
% Graduate FTES	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%

XI. Full-Time Equivalent Students (FTES) by Course Category

	2012/13	2013/14	2014/15	2015/16	2016/17	5 Yr Avg
Major/Concentration Only	94.8	114.8	147.7	173.6	160.0	138.2
GenEd + Major	0.0	0.0	0.0	0.0	10.8	2.2
GenEd Only	30.7	30.9	26.1	30.8	0.0	23.7
GenEd + Major + Service	0.0	0.0	0.0	0.0	0.0	0.0
GenEd + Service	0.0	0.0	0.0	0.0	0.0	0.0
Service + Major	30.6	31.4	34.3	33.7	34.9	33.0
Service Only	37.6	37.0	40.2	40.9	35.1	38.2
Activity Only	0.0	0.0	0.0	0.0	0.0	0.0
Major + GenEd + Activity	0.0	0.0	0.0	0.0	0.0	0.0
Major + Activity	0.0	0.0	0.0	0.0	0.0	0.0
Developmental	0.0	0.0	0.0	0.0	0.0	0.0
Postbaccalaureate/Graduate	0.1	0.3	0.1	0.0	0.0	0.1
Total FTES by Course Category	193.8	214.4	248.4	279.0	240.8	235.3

	2012/13	2013/14	2014/15	2015/16	2016/17	5 Yr Avg
% Major/Concentration Only	48.9%	53.5%	59.5%	62.2%	66.4%	58.7%
% GenEd + Major	0.0%	0.0%	0.0%	0.0%	4.5%	0.9%
% GenEd Only	15.8%	14.4%	10.5%	11.0%	0.0%	10.1%
% GenEd + Major + Service	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% GenEd + Service	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Service + Major	15.8%	14.6%	13.8%	12.1%	14.5%	14.0%
% Service Only	19.4%	17.3%	16.2%	14.7%	14.6%	16.2%
% Activity Only	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Major + GenEd + Activity	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Major + Activity	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Developmental	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Postbaccalaureate/Graduate	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

XII. Full-Time Equivalent Students (FTES) by Campus, College Year

	2012/13	2013/14	2014/15	2015/16	2016/17	5 Yr Avg
Bakersfield Campus	193.7	214.4	248.4	278.9	240.8	235.2
Antelope Valley Campus	0.0	0.0	0.0	0.0	0.0	0.0
Total FTES by Campus	193.7	214.4	248.4	278.9	240.8	235.2

	2012/13	2013/14	2014/15	2015/16	2016/17	5 Yr Avg
% Bakersfield Campus	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
% Antelope Valley Campus	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

XIII. Full-Time Equivalent Students (FTES) by Academic Year & Summer Term

	2012/13	2013/14	2014/15	2015/16	2016/17	5 Yr Avg
Academic Year	193.7	214.4	248.4	278.9	238.8	234.8
Summer	0.0	0.0	0.0	0.0	2.0	0.4
Total FTES by Term Type	193.7	214.4	248.4	278.9	240.8	235.2

	2012/13	2013/14	2014/15	2015/16	2016/17	5 Yr Avg
% Academic Year	100.0%	100.0%	100.0%	100.0%	99.2%	99.8%
% Summer	0.0%	0.0%	0.0%	0.0%	0.8%	0.2%

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XIV. Student Diversity

Majors by Gender

		Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
Undergraduate	Female	31	13.1%	34	11.3%	49	13.7%	72	15.0%	76	14.9%	52.4
	Male	206	86.9%	268	88.7%	308	86.3%	407	85.0%	433	85.1%	324.4
	Total	237	100.0%	302	100.0%	357	100.0%	479	100.0%	509	100.0%	376.8
Postbac (2nd Bachelors)	Female	1	16.7%	2	18.2%	2	18.2%	3	21.4%	1	5.3%	1.8
	Male	5	83.3%	9	81.8%	9	81.8%	11	78.6%	18	94.7%	10.4
	Total	6	100.0%	11	100.0%	11	100.0%	14	100.0%	19	100.0%	12.2
Postbac (Credential/No Degree)	Male	1	100.0%	1	100.0%	1	100.0%	1	100.0%	0		0.8
	Total	1	100.0%	1	100.0%	1	100.0%	1	100.0%	0		0.8
Grand Total		244	100.0%	314	100.0%	369	100.0%	494	100.0%	528	100.0%	389.8

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Majors by Gender - Details

			Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
			N	%	N	%	N	%	N	%	N	%	
Computer Engineering	Undergraduate	Female	8.0	10.1%	10.0	9.5%	14.0	12.0%	19.0	14.6%	22.0	17.9%	14.6
		Male	71.0	89.9%	95.0	90.5%	103.0	88.0%	111.0	85.4%	101.0	82.1%	96.2
		Total	**79.0**	**100.0%**	**105.0**	**100.0%**	**117.0**	**100.0%**	**130.0**	**100.0%**	**123.0**	**100.0%**	**110.8**
	Postbac (2nd Bachelors)	Female					1.0	33.3%					0.2
		Male	1.0	100.0%	2.0	100.0%	2.0	66.7%	3.0	100.0%	2.0	100.0%	2.0
		Total	**1.0**	**100.0%**	**2.0**	**100.0%**	**3.0**	**100.0%**	**3.0**	**100.0%**	**2.0**	**100.0%**	**2.2**
	Total		**80.0**	**100.0%**	**107.0**	**100.0%**	**120.0**	**100.0%**	**133.0**	**100.0%**	**125.0**	**100.0%**	**113.0**
Computer Science	Undergraduate	Female	21.0	14.6%	19.0	12.3%	27.0	15.3%	36.0	15.2%	39.0	15.0%	28.4
		Male	123.0	85.4%	135.0	87.7%	150.0	84.7%	201.0	84.8%	221.0	85.0%	166.0
		Total	**144.0**	**100.0%**	**154.0**	**100.0%**	**177.0**	**100.0%**	**237.0**	**100.0%**	**260.0**	**100.0%**	**194.4**
	Postbac (2nd Bachelors)	Female	1.0	20.0%	1.0	16.7%	1.0	16.7%	3.0	30.0%	1.0	7.7%	1.4
		Male	4.0	80.0%	5.0	83.3%	5.0	83.3%	7.0	70.0%	12.0	92.3%	6.6
		Total	**5.0**	**100.0%**	**6.0**	**100.0%**	**6.0**	**100.0%**	**10.0**	**100.0%**	**13.0**	**100.0%**	**8.0**
	Postbac (Credential/No Degree)	Male	1.0	100.0%									0.2
		Total	**1.0**	**100.0%**									**0.2**
	Total		**150.0**	**100.0%**	**160.0**	**100.0%**	**183.0**	**100.0%**	**247.0**	**100.0%**	**273.0**	**100.0%**	**202.6**
Electrical Engineering	Undergraduate	Female	2.0	14.3%	5.0	11.6%	8.0	12.7%	17.0	15.2%	15.0	11.9%	9.4
		Male	12.0	85.7%	38.0	88.4%	55.0	87.3%	95.0	84.8%	111.0	88.1%	62.2
		Total	**14.0**	**100.0%**	**43.0**	**100.0%**	**63.0**	**100.0%**	**112.0**	**100.0%**	**126.0**	**100.0%**	**71.6**
	Postbac (2nd Bachelors)	Female			1.0	33.3%							0.2
		Male			2.0	66.7%	2.0	100.0%	1.0	100.0%	4.0	100.0%	1.8
		Total			**3.0**	**100.0%**	**2.0**	**100.0%**	**1.0**	**100.0%**	**4.0**	**100.0%**	**2.0**
	Postbac (Credential/No Degree)	Male			1.0	100.0%	1.0	100.0%	1.0	100.0%			0.6
		Total			**1.0**	**100.0%**	**1.0**	**100.0%**	**1.0**	**100.0%**			**0.6**
	Total		**14.0**	**100.0%**	**47.0**	**100.0%**	**66.0**	**100.0%**	**114.0**	**100.0%**	**130.0**	**100.0%**	**74.2**
Grand Total			**244.0**	**100.0%**	**314.0**	**100.0%**	**369.0**	**100.0%**	**494.0**	**100.0%**	**528.0**	**100.0%**	**389.8**

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

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Majors by Age Group

		Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
Undergraduate	19 and Younger	102.0	43.0%	123.0	40.7%	131.0	36.7%	183.0	38.2%	189.0	37.1%	145.6
	20 to 24	93.0	39.2%	132.0	43.7%	160.0	44.8%	213.0	44.5%	231.0	45.4%	165.8
	25 to 29	28.0	11.8%	30.0	9.9%	41.0	11.5%	47.0	9.8%	53.0	10.4%	39.8
	30 to 34	9.0	3.8%	10.0	3.3%	17.0	4.8%	22.0	4.6%	22.0	4.3%	16.0
	35 to 49	3.0	1.3%	7.0	2.3%	8.0	2.2%	13.0	2.7%	13.0	2.6%	8.8
	50 and Older	2.0	0.8%					1.0	0.2%	1.0	0.2%	0.8
	Total	**237.0**	**100.0%**	**302.0**	**100.0%**	**357.0**	**100.0%**	**479.0**	**100.0%**	**509.0**	**100.0%**	**376.8**
Postbac (2nd Bachelors)	20 to 24	1.0	16.7%	3.0	27.3%			2.0	14.3%	5.0	26.3%	2.2
	25 to 29			5.0	45.5%	7.0	63.6%	7.0	50.0%	8.0	42.1%	5.4
	30 to 34	1.0	16.7%	1.0	9.1%	1.0	9.1%	3.0	21.4%	4.0	21.1%	2.0
	35 to 49	3.0	50.0%	2.0	18.2%	3.0	27.3%	2.0	14.3%	2.0	10.5%	2.4
	50 and Older	1.0	16.7%									0.2
	Total	**6.0**	**100.0%**	**11.0**	**100.0%**	**11.0**	**100.0%**	**14.0**	**100.0%**	**19.0**	**100.0%**	**12.2**
Postbac (Credential/No Degree)	30 to 34			1.0	100.0%	1.0	100.0%	1.0	100.0%			0.6
	50 and Older	1.0	100.0%									0.2
	Total	**1.0**	**100.0%**	**1.0**	**100.0%**	**1.0**	**100.0%**	**1.0**	**100.0%**			**0.8**
Grand Total		**244.0**	**100.0%**	**314.0**	**100.0%**	**369.0**	**100.0%**	**494.0**	**100.0%**	**528.0**	**100.0%**	**389.8**

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

Majors by Age Group - Details

			Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
			N	%	N	%	N	%	N	%	N	%	
Computer Engineering	Undergraduate	19 and Younger	53.0	67.1%	51.0	48.6%	56.0	47.9%	68.0	52.3%	58.0	47.2%	57.2
		20 to 24	18.0	22.8%	42.0	40.0%	49.0	41.9%	48.0	36.9%	52.0	42.3%	41.8
		25 to 29	4.0	5.1%	7.0	6.7%	8.0	6.8%	9.0	6.9%	8.0	6.5%	7.2
		30 to 34	2.0	2.5%	3.0	2.9%	2.0	1.7%	2.0	1.5%	4.0	3.3%	2.6
		35 to 49	1.0	1.3%	2.0	1.9%	2.0	1.7%	3.0	2.3%	1.0	0.8%	1.8
		50 and Older	1.0	1.3%									0.2
		Total	**79.0**	**100.0%**	**105.0**	**100.0%**	**117.0**	**100.0%**	**130.0**	**100.0%**	**123.0**	**100.0%**	**110.8**
	Postbac (2nd Bachelors)	20 to 24							1.0	33.3%			0.2
		25 to 29			2.0	100.0%	2.0	66.7%	2.0	66.7%	1.0	50.0%	1.4
		30 to 34					1.0	33.3%			1.0	50.0%	0.4
		35 to 49	1.0	100.0%									0.2
		Total	**1.0**	**100.0%**	**2.0**	**100.0%**	**3.0**	**100.0%**	**3.0**	**100.0%**	**2.0**	**100.0%**	**2.2**
	Total		**80.0**	**100.0%**	**107.0**	**100.0%**	**120.0**	**100.0%**	**133.0**	**100.0%**	**125.0**	**100.0%**	**113.0**
Computer Science	Undergraduate	19 and Younger	40.0	27.8%	49.0	31.8%	51.0	28.8%	65.0	27.4%	87.0	33.5%	58.4
		20 to 24	72.0	50.0%	73.0	47.4%	83.0	46.9%	122.0	51.5%	117.0	45.0%	93.4
		25 to 29	22.0	15.3%	20.0	13.0%	25.0	14.1%	29.0	12.2%	33.0	12.7%	25.8
		30 to 34	7.0	4.9%	7.0	4.5%	12.0	6.8%	13.0	5.5%	13.0	5.0%	10.4
		35 to 49	2.0	1.4%	5.0	3.2%	6.0	3.4%	7.0	3.0%	9.0	3.5%	5.8
		50 and Older	1.0	0.7%					1.0	0.4%	1.0	0.4%	0.6
		Total	**144.0**	**100.0%**	**154.0**	**100.0%**	**177.0**	**100.0%**	**237.0**	**100.0%**	**260.0**	**100.0%**	**194.4**
	Postbac (2nd Bachelors)	20 to 24	1.0	20.0%	1.0	16.7%			1.0	10.0%	5.0	38.5%	1.6
		25 to 29			3.0	50.0%	4.0	66.7%	4.0	40.0%	5.0	38.5%	3.2
		30 to 34	1.0	20.0%	1.0	16.7%			3.0	30.0%	2.0	15.4%	1.4
		35 to 49	2.0	40.0%	1.0	16.7%	2.0	33.3%	2.0	20.0%	1.0	7.7%	1.6
		50 and Older	1.0	20.0%									0.2
		Total	**5.0**	**100.0%**	**6.0**	**100.0%**	**6.0**	**100.0%**	**10.0**	**100.0%**	**13.0**	**100.0%**	**8.0**
	Postbac (Credential/No Degree)	50 and Older	1.0	100.0%									0.2
		Total	**1.0**	**100.0%**									**0.2**
	Total		**150.0**	**100.0%**	**160.0**	**100.0%**	**183.0**	**100.0%**	**247.0**	**100.0%**	**273.0**	**100.0%**	**202.6**
Electrical Engineering	Undergraduate	19 and Younger	9.0	64.3%	23.0	53.5%	24.0	38.1%	50.0	44.6%	44.0	34.9%	30.0
		20 to 24	3.0	21.4%	17.0	39.5%	28.0	44.4%	43.0	38.4%	62.0	49.2%	30.6
		25 to 29	2.0	14.3%	3.0	7.0%	8.0	12.7%	9.0	8.0%	12.0	9.5%	6.8
		30 to 34					3.0	4.8%	7.0	6.3%	5.0	4.0%	3.0
		35 to 49							3.0	2.7%	3.0	2.4%	1.2
		Total	**14.0**	**100.0%**	**43.0**	**100.0%**	**63.0**	**100.0%**	**112.0**	**100.0%**	**126.0**	**100.0%**	**71.6**
	Postbac (2nd Bachelors)	20 to 24			2.0	66.7%							0.4
		25 to 29					1.0	50.0%	1.0	100.0%	2.0	50.0%	0.8
		30 to 34									1.0	25.0%	0.2
		35 to 49			1.0	33.3%	1.0	50.0%			1.0	25.0%	0.6
		Total			**3.0**	**100.0%**	**2.0**	**100.0%**	**1.0**	**100.0%**	**4.0**	**100.0%**	**2.0**
	Postbac (Credential/No Degree)	30 to 34			1.0	100.0%	1.0	100.0%	1.0	100.0%			0.6
		Total			**1.0**	**100.0%**	**1.0**	**100.0%**	**1.0**	**100.0%**			**0.6**
	Total		**14.0**	**100.0%**	**47.0**	**100.0%**	**66.0**	**100.0%**	**114.0**	**100.0%**	**130.0**	**100.0%**	**74.2**
Grand Total			**244.0**	**100.0%**	**314.0**	**100.0%**	**369.0**	**100.0%**	**494.0**	**100.0%**	**528.0**	**100.0%**	**389.8**

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

Majors by Ethnicity

		Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
Undergraduate	American Indian or Alaska Native	2.0	0.8%	1.0	0.3%	1.0	0.3%	1.0	0.2%	1.0	0.2%	1.2
	Asian	21.0	8.9%	24.0	7.9%	37.0	10.4%	56.0	11.7%	68.0	13.4%	41.2
	Black or African American	17.0	7.2%	15.0	5.0%	26.0	7.3%	29.0	6.1%	22.0	4.3%	21.8
	Hispanic/Latino	103.0	43.5%	129.0	42.7%	160.0	44.8%	218.0	45.5%	250.0	49.1%	172.0
	Native Hawaiian or Other Pacific Islander	3.0	1.3%	4.0	1.3%	2.0	0.6%	2.0	0.4%	1.0	0.2%	2.4
	White	64.0	27.0%	83.0	27.5%	85.0	23.8%	112.0	23.4%	105.0	20.6%	89.8
	Two or More Races	13.0	5.5%	16.0	5.3%	12.0	3.4%	19.0	4.0%	11.0	2.2%	14.2
	Unknown	9.0	3.8%	22.0	7.3%	19.0	5.3%	17.0	3.5%	18.0	3.5%	17.0
	Non-Resident Alien	5.0	2.1%	8.0	2.6%	15.0	4.2%	25.0	5.2%	33.0	6.5%	17.2
	Total	237.0	100.0%	302.0	100.0%	357.0	100.0%	479.0	100.0%	509.0	100.0%	376.8
Postbac (2nd Bachelors)	Asian			1.0	9.1%	4.0	36.4%	4.0	28.6%	4.0	21.1%	2.6
	Hispanic/Latino			3.0	27.3%	2.0	18.2%	4.0	28.6%	5.0	26.3%	2.8
	White	4.0	66.7%	5.0	45.5%	4.0	36.4%	5.0	35.7%	8.0	42.1%	5.2
	Two or More Races					1.0	9.1%	1.0	7.1%	1.0	5.3%	0.6
	Unknown	2.0	33.3%	2.0	18.2%					1.0	5.3%	1.0
	Total	6.0	100.0%	11.0	100.0%	11.0	100.0%	14.0	100.0%	19.0	100.0%	12.2
Postbac (Credential/No Degree)	Black or African American			1.0	100.0%	1.0	100.0%	1.0	100.0%			0.6
	White	1.0	100.0%									0.2
	Total	1.0	100.0%	1.0	100.0%	1.0	100.0%	1.0	100.0%			0.8
Grand Total		244.0	100.0%	314.0	100.0%	369.0	100.0%	494.0	100.0%	528.0	100.0%	389.8

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

Majors by Ethnicity - Details

			Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
			N	%	N	%	N	%	N	%	N	%	
Computer Engineering	Undergraduate	Asian	10.0	12.7%	10.0	9.5%	13.0	11.1%	21.0	16.2%	25.0	20.3%	15.8
		Black or African American	5.0	6.3%	5.0	4.8%	10.0	8.5%	8.0	6.2%	3.0	2.4%	6.2
		Hispanic/Latino	36.0	45.6%	50.0	47.6%	58.0	49.6%	57.0	43.8%	61.0	49.6%	52.4
		Native Hawaiian or Other Pacif..	1.0	1.3%	1.0	1.0%							0.4
		White	17.0	21.5%	25.0	23.8%	22.0	18.8%	32.0	24.6%	24.0	19.5%	24.0
		Two or More Races	7.0	8.9%	4.0	3.8%	4.0	3.4%	3.0	2.3%			3.6
		Unknown	2.0	2.5%	7.0	6.7%	6.0	5.1%	4.0	3.1%	4.0	3.3%	4.6
		Non-Resident Alien	1.0	1.3%	3.0	2.9%	4.0	3.4%	5.0	3.8%	6.0	4.9%	3.8
		Total	79.0	100.0%	105.0	100.0%	117.0	100.0%	130.0	100.0%	123.0	100.0%	110.8
	Postbac (2nd Bachelors)	Asian					1.0	33.3%					0.2
		Hispanic/Latino			1.0	50.0%	1.0	33.3%	2.0	66.7%	1.0	50.0%	1.0
		White			1.0	50.0%	1.0	33.3%	1.0	33.3%			0.6
		Unknown	1.0	100.0%							1.0	50.0%	0.4
		Total	1.0	100.0%	2.0	100.0%	3.0	100.0%	3.0	100.0%	2.0	100.0%	2.2
	Total		80.0	100.0%	107.0	100.0%	120.0	100.0%	133.0	100.0%	125.0	100.0%	113.0
Computer Science	Undergraduate	American Indian or Alaska Nati..	2.0	1.4%					1.0	0.4%	1.0	0.4%	0.8
		Asian	10.0	6.9%	13.0	8.4%	21.0	11.9%	24.0	10.1%	30.0	11.5%	19.6
		Black or African American	10.0	6.9%	6.0	3.9%	13.0	7.3%	15.0	6.3%	14.0	5.4%	11.6
		Hispanic/Latino	64.0	44.4%	63.0	40.9%	71.0	40.1%	108.0	45.6%	118.0	45.4%	84.8
		Native Hawaiian or Other Pacif..	1.0	0.7%	3.0	1.9%	2.0	1.1%	2.0	0.8%	1.0	0.4%	1.8
		White	43.0	29.9%	45.0	29.2%	48.0	27.1%	55.0	23.2%	60.0	23.1%	50.2
		Two or More Races	6.0	4.2%	10.0	6.5%	5.0	2.8%	11.0	4.6%	8.0	3.1%	8.0
		Unknown	6.0	4.2%	11.0	7.1%	10.0	5.6%	11.0	4.6%	9.0	3.5%	9.4
		Non-Resident Alien	2.0	1.4%	3.0	1.9%	7.0	4.0%	10.0	4.2%	19.0	7.3%	8.2
		Total	144.0	100.0%	154.0	100.0%	177.0	100.0%	237.0	100.0%	260.0	100.0%	194.4
	Postbac (2nd Bachelors)	Asian			1.0	16.7%	3.0	50.0%	4.0	40.0%	4.0	30.8%	2.4
		Hispanic/Latino			1.0	16.7%	1.0	16.7%	2.0	20.0%	4.0	30.8%	1.6
		White	4.0	80.0%	2.0	33.3%	2.0	33.3%	4.0	40.0%	5.0	38.5%	3.4
		Unknown	1.0	20.0%	2.0	33.3%							0.6
		Total	5.0	100.0%	6.0	100.0%	6.0	100.0%	10.0	100.0%	13.0	100.0%	8.0
	Postbac (Credential/No Deg..	White	1.0	100.0%									0.2
		Total	1.0	100.0%									0.2
	Total		150.0	100.0%	160.0	100.0%	183.0	100.0%	247.0	100.0%	273.0	100.0%	202.6
Electrical Engineering	Undergraduate	American Indian or Alaska Nati..			1.0	2.3%	1.0	1.6%					0.4
		Asian	1.0	7.1%	1.0	2.3%	3.0	4.8%	11.0	9.8%	13.0	10.3%	5.8
		Black or African American	2.0	14.3%	4.0	9.3%	3.0	4.8%	6.0	5.4%	5.0	4.0%	4.0
		Hispanic/Latino	3.0	21.4%	16.0	37.2%	31.0	49.2%	53.0	47.3%	71.0	56.3%	34.8
		Native Hawaiian or Other Pacif..	1.0	7.1%									0.2
		White	4.0	28.6%	13.0	30.2%	15.0	23.8%	25.0	22.3%	21.0	16.7%	15.6
		Two or More Races			2.0	4.7%	3.0	4.8%	5.0	4.5%	3.0	2.4%	2.6
		Unknown	1.0	7.1%	4.0	9.3%	3.0	4.8%	2.0	1.8%	5.0	4.0%	3.0
		Non-Resident Alien	2.0	14.3%	2.0	4.7%	4.0	6.3%	10.0	8.9%	8.0	6.3%	5.2
		Total	14.0	100.0%	43.0	100.0%	63.0	100.0%	112.0	100.0%	126.0	100.0%	71.6
	Postbac (2nd Bachelors)	Hispanic/Latino			1.0	33.3%							0.2
		White			2.0	66.7%	1.0	50.0%			3.0	75.0%	1.2
		Two or More Races					1.0	50.0%	1.0	100.0%	1.0	25.0%	0.6
		Total			3.0	100.0%	2.0	100.0%	1.0	100.0%	4.0	100.0%	2.0
	Postbac (Credential/No Deg..	Black or African American			1.0	100.0%	1.0	100.0%	1.0	100.0%			0.6
		Total			1.0	100.0%	1.0	100.0%	1.0	100.0%			0.6
	Total		14.0	100.0%	47.0	100.0%	66.0	100.0%	114.0	100.0%	130.0	100.0%	74.2
Grand Total			244.0	100.0%	314.0	100.0%	369.0	100.0%	494.0	100.0%	528.0	100.0%	389.8

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

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Majors by Minority Status

		Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
Undergraduate	Under-Represented Minorities (URM)	125.0	52.7%	149.0	49.3%	189.0	52.9%	250.0	52.2%	274.0	53.8%	197.4
	Not Under-Represented Minorities (Non-URM)	98.0	41.4%	123.0	40.7%	134.0	37.5%	187.0	39.0%	184.0	36.1%	145.2
	Declined to State/Unknown/Other	9.0	3.8%	22.0	7.3%	19.0	5.3%	17.0	3.5%	18.0	3.5%	17.0
	Non-Resident Aliens	5.0	2.1%	8.0	2.6%	15.0	4.2%	25.0	5.2%	33.0	6.5%	17.2
	Total	237.0	100.0%	302.0	100.0%	357.0	100.0%	479.0	100.0%	509.0	100.0%	376.8
Postbac (2nd Bachelors)	Under-Represented Minorities (URM)			3.0	27.3%	2.0	18.2%	4.0	28.6%	5.0	26.3%	2.8
	Not Under-Represented Minorities (Non-URM)	4.0	66.7%	6.0	54.5%	9.0	81.8%	10.0	71.4%	13.0	68.4%	8.4
	Declined to State/Unknown/Other	2.0	33.3%	2.0	18.2%					1.0	5.3%	1.0
	Total	6.0	100.0%	11.0	100.0%	11.0	100.0%	14.0	100.0%	19.0	100.0%	12.2
Postbac (Credential/No Degree)	Under-Represented Minorities (URM)			1.0	100.0%	1.0	100.0%	1.0	100.0%			0.6
	Not Under-Represented Minorities (Non-URM)	1.0	100.0%									0.2
	Total	1.0	100.0%	1.0	100.0%	1.0	100.0%	1.0	100.0%			0.8
Grand Total		244.0	100.0%	314.0	100.0%	369.0	100.0%	494.0	100.0%	528.0	100.0%	389.8

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

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Majors by Minority Status - Details

			Fall 2012		Fall 2013		Fall 2014		Fall 2015		Fall 2016		5 Yr Avg
			N	%	N	%	N	%	N	%	N	%	
Computer Engineering	Undergraduate	Under-Represented Minorities (URM)	42.0	53.2%	56.0	53.3%	68.0	58.1%	65.0	50.0%	64.0	52.0%	59.0
		Not Under-Represented Minorities (Non..	34.0	43.0%	39.0	37.1%	39.0	33.3%	56.0	43.1%	49.0	39.8%	43.4
		Declined to State/Unknown/Other	2.0	2.5%	7.0	6.7%	6.0	5.1%	4.0	3.1%	4.0	3.3%	4.6
		Non-Resident Aliens	1.0	1.3%	3.0	2.9%	4.0	3.4%	5.0	3.8%	6.0	4.9%	3.8
		Total	79.0	100.0%	105.0	100.0%	117.0	100.0%	130.0	100.0%	123.0	100.0%	110.8
	Postbac (2nd Bachelors)	Under-Represented Minorities (URM)			1.0	50.0%	1.0	33.3%	2.0	66.7%	1.0	50.0%	1.0
		Not Under-Represented Minorities (Non..			1.0	50.0%	2.0	66.7%	1.0	33.3%			0.8
		Declined to State/Unknown/Other	1.0	100.0%							1.0	50.0%	0.4
		Total	1.0	100.0%	2.0	100.0%	3.0	100.0%	3.0	100.0%	2.0	100.0%	2.2
	Total		80.0	100.0%	107.0	100.0%	120.0	100.0%	133.0	100.0%	125.0	100.0%	113.0
Computer Science	Undergraduate	Under-Represented Minorities (URM)	77.0	53.5%	72.0	46.8%	86.0	48.6%	126.0	53.2%	134.0	51.5%	99.0
		Not Under-Represented Minorities (Non..	59.0	41.0%	68.0	44.2%	74.0	41.8%	90.0	38.0%	98.0	37.7%	77.8
		Declined to State/Unknown/Other	6.0	4.2%	11.0	7.1%	10.0	5.6%	11.0	4.6%	9.0	3.5%	9.4
		Non-Resident Aliens	2.0	1.4%	3.0	1.9%	7.0	4.0%	10.0	4.2%	19.0	7.3%	8.2
		Total	144.0	100.0%	154.0	100.0%	177.0	100.0%	237.0	100.0%	260.0	100.0%	194.4
	Postbac (2nd Bachelors)	Under-Represented Minorities (URM)			1.0	16.7%	1.0	16.7%	2.0	20.0%	4.0	30.8%	1.6
		Not Under-Represented Minorities (Non..	4.0	80.0%	3.0	50.0%	5.0	83.3%	8.0	80.0%	9.0	69.2%	5.8
		Declined to State/Unknown/Other	1.0	20.0%	2.0	33.3%							0.6
		Total	5.0	100.0%	6.0	100.0%	6.0	100.0%	10.0	100.0%	13.0	100.0%	8.0
	Postbac (Credential/No Deg..	Not Under-Represented Minorities (Non..	1.0	100.0%									0.2
		Total	1.0	100.0%									0.2
	Total		150.0	100.0%	160.0	100.0%	183.0	100.0%	247.0	100.0%	273.0	100.0%	202.6
Electrical Engineering	Undergraduate	Under-Represented Minorities (URM)	6.0	42.9%	21.0	48.8%	35.0	55.6%	59.0	52.7%	76.0	60.3%	39.4
		Not Under-Represented Minorities (Non..	5.0	35.7%	16.0	37.2%	21.0	33.3%	41.0	36.6%	37.0	29.4%	24.0
		Declined to State/Unknown/Other	1.0	7.1%	4.0	9.3%	3.0	4.8%	2.0	1.8%	5.0	4.0%	3.0
		Non-Resident Aliens	2.0	14.3%	2.0	4.7%	4.0	6.3%	10.0	8.9%	8.0	6.3%	5.2
		Total	14.0	100.0%	43.0	100.0%	63.0	100.0%	112.0	100.0%	126.0	100.0%	71.6
	Postbac (2nd Bachelors)	Under-Represented Minorities (URM)			1.0	33.3%							0.2
		Not Under-Represented Minorities (Non..			2.0	66.7%	2.0	100.0%	1.0	100.0%	4.0	100.0%	1.8
		Total			3.0	100.0%	2.0	100.0%	1.0	100.0%	4.0	100.0%	2.0
	Postbac (Credential/No Deg..	Under-Represented Minorities (URM)			1.0	100.0%	1.0	100.0%	1.0	100.0%			0.6
		Total			1.0	100.0%	1.0	100.0%	1.0	100.0%			0.6
	Total		14.0	100.0%	47.0	100.0%	66.0	100.0%	114.0	100.0%	130.0	100.0%	74.2
Grand Total			244.0	100.0%	314.0	100.0%	369.0	100.0%	494.0	100.0%	528.0	100.0%	389.8

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

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Degrees by Gender

		2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
First Bachelors	Female	2.00	10.5%	2.00	6.7%	2.00	5.0%	6.00	11.5%	7.00	13.2%	3.8
	Male	17.00	89.5%	28.00	93.3%	38.00	95.0%	46.00	88.5%	46.00	86.8%	35.0
	Total	19.00	100.0%	30.00	100.0%	40.00	100.0%	52.00	100.0%	53.00	100.0%	38.8
Second Bachelors	Female					1.00	100.0%					0.2
	Male	1.00	100.0%	3.00	100.0%			2.00	100.0%			1.2
	Total	1.00	100.0%	3.00	100.0%	1.00	100.0%	2.00	100.0%			1.4
Total Degrees Awarded		20.00	100.0%	33.00	100.0%	41.00	100.0%	54.00	100.0%	53.00	100.0%	40.2

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Degrees by Gender - Details

			2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
			N	%	N	%	N	%	N	%	N	%	
Computer Engineeri..	First Bachelors	Female			1.00	25.0%	1.00	11.1%					0.4
		Male	2.00	100.0%	3.00	75.0%	8.00	88.9%	9.00	100.0%	9.00	100.0%	6.2
		Total	2.00	100.0%	4.00	100.0%	9.00	100.0%	9.00	100.0%	9.00	100.0%	6.6
	Second Bachelors	Male	1.00	100.0%									0.2
		Total	1.00	100.0%									0.2
	Total		3.00	100.0%	4.00	100.0%	9.00	100.0%	9.00	100.0%	9.00	100.0%	6.8
Computer Science	First Bachelors	Female	2.00	11.8%	1.00	4.8%	1.00	4.2%	3.00	9.1%	4.00	15.4%	2.2
		Male	15.00	88.2%	20.00	95.2%	23.00	95.8%	30.00	90.9%	22.00	84.6%	22.0
		Total	17.00	100.0%	21.00	100.0%	24.00	100.0%	33.00	100.0%	26.00	100.0%	24.2
	Second Bachelors	Female					1.00	100.0%					0.2
		Male			2.00	100.0%			2.00	100.0%			0.8
		Total			2.00	100.0%	1.00	100.0%	2.00	100.0%			1.0
	Total		17.00	100.0%	23.00	100.0%	25.00	100.0%	35.00	100.0%	26.00	100.0%	25.2
Electrical Engineeri..	First Bachelors	Female							3.00	30.0%	3.00	16.7%	1.2
		Male			5.00	100.0%	7.00	100.0%	7.00	70.0%	15.00	83.3%	6.8
		Total			5.00	100.0%	7.00	100.0%	10.00	100.0%	18.00	100.0%	8.0
	Second Bachelors	Male			1.00	100.0%							0.2
		Total			1.00	100.0%							0.2
	Total				6.00	100.0%	7.00	100.0%	10.00	100.0%	18.00	100.0%	8.2
Total Degrees Awarded			20.00	100.0%	33.00	100.0%	41.00	100.0%	54.00	100.0%	53.00	100.0%	40.2

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

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Degrees by Age Group

		2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
First Bachelors	20 to 24	8.00	42.11%	16.00	53.33%	28.00	70.00%	28.00	53.85%	30.00	56.60%	22.0
	25 to 29	6.00	31.58%	9.00	30.00%	10.00	25.00%	15.00	28.85%	13.00	24.53%	10.6
	30 to 34	3.00	15.79%	2.00	6.67%	1.00	2.50%	7.00	13.46%	9.00	16.98%	4.4
	35 to 49	1.00	5.26%	2.00	6.67%	1.00	2.50%	2.00	3.85%	1.00	1.89%	1.4
	50 and Older	1.00	5.26%	1.00	3.33%							0.4
	Total	19.00	100.00%	30.00	100.00%	40.00	100.00%	52.00	100.00%	53.00	100.00%	38.8
Second Bachelors	20 to 24			1.00	33.33%							0.2
	25 to 29			1.00	33.33%	1.00	100.00%	1.00	50.00%			0.6
	30 to 34			1.00	33.33%							0.2
	35 to 49	1.00	100.00%					1.00	50.00%			0.4
	Total	1.00	100.00%	3.00	100.00%	1.00	100.00%	2.00	100.00%			1.4
Total Degrees Awarded		20.00	100.00%	33.00	100.00%	41.00	100.00%	54.00	100.00%	53.00	100.00%	40.2

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

Degrees by Age Group - Details

			2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
			N	%	N	%	N	%	N	%	N	%	
Computer Engineering	First Bachelors	20 to 24	1.00	50.0%	3.00	75.0%	7.00	77.8%	6.00	66.7%	4.00	44.4%	4.2
		25 to 29	1.00	50.0%	1.00	25.0%	2.00	22.2%	1.00	11.1%	3.00	33.3%	1.6
		30 to 34							1.00	11.1%	1.00	11.1%	0.4
		35 to 49							1.00	11.1%	1.00	11.1%	0.4
		Total	**2.00**	**100.0%**	**4.00**	**100.0%**	**9.00**	**100.0%**	**9.00**	**100.0%**	**9.00**	**100.0%**	6.6
	Second Bachelors	35 to 49	1.00	100.0%									0.2
		Total	**1.00**	**100.0%**									**0.2**
	Total		**3.00**	**100.0%**	**4.00**	**100.0%**	**9.00**	**100.0%**	**9.00**	**100.0%**	**9.00**	**100.0%**	6.8
Computer Science	First Bachelors	20 to 24	7.00	41.2%	12.00	57.1%	16.00	66.7%	15.00	45.5%	16.00	61.5%	13.2
		25 to 29	5.00	29.4%	5.00	23.8%	6.00	25.0%	14.00	42.4%	6.00	23.1%	7.2
		30 to 34	3.00	17.6%	1.00	4.8%	1.00	4.2%	4.00	12.1%	4.00	15.4%	2.6
		35 to 49	1.00	5.9%	2.00	9.5%	1.00	4.2%					0.8
		50 and Older	1.00	5.9%	1.00	4.8%							0.4
		Total	**17.00**	**100.0%**	**21.00**	**100.0%**	**24.00**	**100.0%**	**33.00**	**100.0%**	**26.00**	**100.0%**	24.2
	Second Bachelors	25 to 29			1.00	50.0%	1.00	100.0%	1.00	50.0%			0.6
		30 to 34			1.00	50.0%							0.2
		35 to 49							1.00	50.0%			0.2
		Total			**2.00**	**100.0%**	**1.00**	**100.0%**	**2.00**	**100.0%**			**1.0**
	Total		**17.00**	**100.0%**	**23.00**	**100.0%**	**25.00**	**100.0%**	**35.00**	**100.0%**	**26.00**	**100.0%**	25.2
Electrical Engineering	First Bachelors	20 to 24			1.00	20.0%	5.00	71.4%	7.00	70.0%	10.00	55.6%	4.6
		25 to 29			3.00	60.0%	2.00	28.6%			4.00	22.2%	1.8
		30 to 34			1.00	20.0%			2.00	20.0%	4.00	22.2%	1.4
		35 to 49							1.00	10.0%			0.2
		Total			**5.00**	**100.0%**	**7.00**	**100.0%**	**10.00**	**100.0%**	**18.00**	**100.0%**	8.0
	Second Bachelors	20 to 24			1.00	100.0%							0.2
		Total			**1.00**	**100.0%**							**0.2**
	Total				**6.00**	**100.0%**	**7.00**	**100.0%**	**10.00**	**100.0%**	**18.00**	**100.0%**	8.2
Total Degrees Awarded			**20.00**	**100.0%**	**33.00**	**100.0%**	**41.00**	**100.0%**	**54.00**	**100.0%**	**53.00**	**100.0%**	40.2

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

Degrees by Ethnicity

		2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
First Bachelors	Asian	2.00	10.5%	3.00	10.0%	3.00	7.5%	5.00	9.6%	10.00	18.9%	4.6
	Black or African American					1.00	2.5%	2.00	3.8%	1.00	1.9%	0.8
	Hispanic/Latino	5.00	26.3%	6.00	20.0%	16.00	40.0%	23.00	44.2%	22.00	41.5%	14.4
	Two or More Races			4.00	13.3%	3.00	7.5%	1.00	1.9%	1.00	1.9%	1.8
	White	10.00	52.6%	14.00	46.7%	12.00	30.0%	17.00	32.7%	17.00	32.1%	14.0
	Unknown	2.00	10.5%	2.00	6.7%	2.00	5.0%	1.00	1.9%			1.4
	Non-Resident Alien			1.00	3.3%	1.00	2.5%	2.00	3.8%	2.00	3.8%	1.2
	Native Hawaiian or Other Pacific Islander					2.00	5.0%	1.00	1.9%			0.6
	Total	**19.00**	**100.0%**	**30.00**	**100.0%**	**40.00**	**100.0%**	**52.00**	**100.0%**	**53.00**	**100.0%**	38.8
Second Bachelors	Asian					1.00	100.0%	1.00	50.0%			0.4
	White			2.00	66.7%			1.00	50.0%			0.6
	Unknown	1.00	100.0%	1.00	33.3%							0.4
	Total	**1.00**	**100.0%**	**3.00**	**100.0%**	**1.00**	**100.0%**	**2.00**	**100.0%**			1.4
Total Degrees Awarded		**20.00**	**100.0%**	**33.00**	**100.0%**	**41.00**	**100.0%**	**54.00**	**100.0%**	**53.00**	**100.0%**	40.2

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

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Degrees by Ethnicity - Details

			2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
			N	%	N	%	N	%	N	%	N	%	
Computer Engineering	First Bachelors	Asian			1.00	25.0%	2.00	22.2%	3.00	33.3%	2.00	22.2%	1.6
		Black or African American							1.00	11.1%			0.2
		Hispanic/Latino			1.00	25.0%	1.00	11.1%	4.00	44.4%	4.00	44.4%	2.0
		Two or More Races					2.00	22.2%					0.4
		White	2.00	100.0%	2.00	50.0%	2.00	22.2%	1.00	11.1%	2.00	22.2%	1.8
		Unknown					1.00	11.1%					0.2
		Non-Resident Alien					1.00	11.1%			1.00	11.1%	0.4
		Total	2.00	100.0%	4.00	100.0%	9.00	100.0%	9.00	100.0%	9.00	100.0%	6.6
	Second Bachelors	Unknown	1.00	100.0%									0.2
		Total	1.00	100.0%									0.2
	Total		3.00	100.0%	4.00	100.0%	9.00	100.0%	9.00	100.0%	9.00	100.0%	6.8
Computer Science	First Bachelors	Asian	2.00	11.8%	2.00	9.5%	1.00	4.2%	2.00	6.1%	7.00	26.9%	2.8
		Black or African American							1.00	3.0%	1.00	3.8%	0.4
		Hispanic/Latino	5.00	29.4%	5.00	23.8%	11.00	45.8%	15.00	45.5%	8.00	30.8%	8.8
		Two or More Races			2.00	9.5%					1.00	3.8%	0.6
		White	8.00	47.1%	9.00	42.9%	9.00	37.5%	12.00	36.4%	9.00	34.6%	9.4
		Unknown	2.00	11.8%	2.00	9.5%	1.00	4.2%	1.00	3.0%			1.2
		Non-Resident Alien			1.00	4.8%			1.00	3.0%			0.4
		Native Hawaiian or Other Pacific..					2.00	8.3%	1.00	3.0%			0.6
		Total	17.00	100.0%	21.00	100.0%	24.00	100.0%	33.00	100.0%	26.00	100.0%	24.2
	Second Bachelors	Asian					1.00	100.0%	1.00	50.0%			0.4
		White			1.00	50.0%			1.00	50.0%			0.4
		Unknown			1.00	50.0%							0.2
		Total			2.00	100.0%	1.00	100.0%	2.00	100.0%			1.0
	Total		17.00	100.0%	23.00	100.0%	25.00	100.0%	35.00	100.0%	26.00	100.0%	25.2
Electrical Engineering	First Bachelors	Asian									1.00	5.6%	0.2
		Black or African American					1.00	14.3%					0.2
		Hispanic/Latino					4.00	57.1%	4.00	40.0%	10.00	55.6%	3.6
		Two or More Races			2.00	40.0%	1.00	14.3%	1.00	10.0%			0.8
		White			3.00	60.0%	1.00	14.3%	4.00	40.0%	6.00	33.3%	2.8
		Non-Resident Alien							1.00	10.0%	1.00	5.6%	0.4
		Total			5.00	100.0%	7.00	100.0%	10.00	100.0%	18.00	100.0%	8.0
	Second Bachelors	White			1.00	100.0%							0.2
		Total			1.00	100.0%							0.2
	Total				6.00	100.0%	7.00	100.0%	10.00	100.0%	18.00	100.0%	8.2
Total Degrees Awarded			20.00	100.0%	33.00	100.0%	41.00	100.0%	54.00	100.0%	53.00	100.0%	40.2

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

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Degrees by Minority Status

		2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
		N	%	N	%	N	%	N	%	N	%	
First Bachelors	URM	5.00	26.3%	6.00	20.0%	17.00	42.5%	25.00	48.1%	23.00	43.4%	15.2
	Non-URM/Unknown Ethnicity	14.00	73.7%	23.00	76.7%	22.00	55.0%	25.00	48.1%	28.00	52.8%	22.4
	Non-Resident Alien			1.00	3.3%	1.00	2.5%	2.00	3.8%	2.00	3.8%	1.2
	Total	19.00	100.0%	30.00	100.0%	40.00	100.0%	52.00	100.0%	53.00	100.0%	38.8
Second Bachelors	Non-URM/Unknown Ethnicity	1.00	100.0%	3.00	100.0%	1.00	100.0%	2.00	100.0%			1.4
	Total	1.00	100.0%	3.00	100.0%	1.00	100.0%	2.00	100.0%			1.4
Total Degrees Awarded		20.00	100.0%	33.00	100.0%	41.00	100.0%	54.00	100.0%	53.00	100.0%	40.2

Academic Program Data Profile: Computer Science, Computer & Electrical Engineering

Degrees by Minority Status - Details

			2012/13		2013/14		2014/15		2015/16		2016/17		5 Yr Avg
			N	%	N	%	N	%	N	%	N	%	
Computer Engineering	First Bachelors	URM			1.00	25.0%	1.00	11.1%	5.00	55.6%	4.00	44.4%	2.2
		Non-URM/Unknown Ethnicity	2.00	100.0%	3.00	75.0%	7.00	77.8%	4.00	44.4%	4.00	44.4%	4.0
		Non-Resident Alien					1.00	11.1%			1.00	11.1%	0.4
		Total	2.00	100.0%	4.00	100.0%	9.00	100.0%	9.00	100.0%	9.00	100.0%	6.6
	Second Bachelors	Non-URM/Unknown Ethnicity	1.00	100.0%									0.2
		Total	1.00	100.0%									0.2
	Total		3.00	100.0%	4.00	100.0%	9.00	100.0%	9.00	100.0%	9.00	100.0%	6.8
Computer Science	First Bachelors	URM	5.00	29.4%	5.00	23.8%	11.00	45.8%	16.00	48.5%	9.00	34.6%	9.2
		Non-URM/Unknown Ethnicity	12.00	70.6%	15.00	71.4%	13.00	54.2%	16.00	48.5%	17.00	65.4%	14.6
		Non-Resident Alien			1.00	4.8%			1.00	3.0%			0.4
		Total	17.00	100.0%	21.00	100.0%	24.00	100.0%	33.00	100.0%	26.00	100.0%	24.2
	Second Bachelors	Non-URM/Unknown Ethnicity			2.00	100.0%	1.00	100.0%	2.00	100.0%			1.0
		Total			2.00	100.0%	1.00	100.0%	2.00	100.0%			1.0
	Total		17.00	100.0%	23.00	100.0%	25.00	100.0%	35.00	100.0%	26.00	100.0%	25.2
Electrical Engineering	First Bachelors	URM					5.00	71.4%	4.00	40.0%	10.00	55.6%	3.8
		Non-URM/Unknown Ethnicity			5.00	100.0%	2.00	28.6%	5.00	50.0%	7.00	38.9%	3.8
		Non-Resident Alien							1.00	10.0%	1.00	5.6%	0.4
		Total			5.00	100.0%	7.00	100.0%	10.00	100.0%	18.00	100.0%	8.0
	Second Bachelors	Non-URM/Unknown Ethnicity			1.00	100.0%							0.2
		Total			1.00	100.0%							0.2
	Total				6.00	100.0%	7.00	100.0%	10.00	100.0%	18.00	100.0%	8.2
Total Degrees Awarded			20.00	100.0%	33.00	100.0%	41.00	100.0%	54.00	100.0%	53.00	100.0%	40.2

XV. Definitions

Academic Year — Prior to Fall 2016: Fall, Winter and Spring quarters
Fall 2016 and Beyond: Fall and Spring semesters

College Year — Prior to Fall 2016: Summer, Fall, Winter and Spring quarters
Fall 2016 and Beyond: Summer, Fall and Spring semesters

FERP — Faculty Early Retirement Program

Full-Time Lecturer — Temporary faculty with a contract for 1 or more years

FTEF — Full-Time Equivalent Faculty - 12 weighted teaching units for Tenured & Tenure Track Faculty; 15 weighted teaching units for lecturers & part-time instructors

FTES — Full-Time Equivalent Students - 15 units per term for Undergraduate, Credential, 2nd Bachelors & Unclassified Postbaccalaureate Students; 12 units per term for Masters and Doctoral Students

Part-Time Lecturer — Temporary faculty with a contract for less than 1 year

Quarter to Semester Conversion — CSU Bakersfield converted from a quarter to semester system in Fall 2016. Quarter units are converted to semester units by multiplying the units by 0.66667.

SFR — Student Faculty Ratio - Total FTES/Total FTEF

SFR from Chancellor's Office — Chancellor's Office Student Faculty Ratio - FTES and FTEF taken from https://csyou.calstate.edu/Tools/academic-affairs/apdb/APDBCampusesFall/apd78b.terms074-164.BAK.html

URM — Under-Represented Minorities - Students who identify their ethnicity as African American, Hispanic/Latino, Native American or Pacific Islander

B. Current Catalog Copy

1. 2013-15 Catalog Copy (Quarters)

COMPUTER ENGINEERING

Department of Computer and Electrical Engineering and Computer Science
School of Natural Sciences, Mathematics, and Engineering
Department Chair: Marc Thomas
Program Office: Science Building III, 317
Telephone: (661) 654-3082
email: ceecs@cs.csubak.edu
Website: www.cs.csubak.edu
Faculty: M. Danforth, S. Garcia, S. Jafarzadeh, W. Li, H. Mehrpoyan, T. Meyer, D. Meyers, L. Niu, M. Thomas, H. Wang, A. Wani

Program Description
Computer Engineering is a field, which in some sense, resides between the long-established fields of Computer Science and Electrical Engineering. It is concerned with topics such as analog and digital circuit design, embedded controllers, computer hardware, system software, computer system design, data communication, signal processing, computer networks, robotics, computer vision, graphics and image processing, and other topics in computing where hardware plays an important role. Computer engineers often work with other engineers, physical scientists, and software engineers.

Requirements for the Bachelor of Science Degree in Computer Engineering

Total Units Required to Graduate		**180-186 units**
Major Requirements		**139 units**
ECE/CMPS Courses	81	
Cognates	58	
Minor Requirement		**0 units**
Other University Requirements		**40-47 units**
CSUB 101	2	
American Institutions	5	
Area A	10*	
Area B	0*	
Area C	10	
Area D	10**	
Theme 1	0*	
Theme 2	0**	
Theme 3	0**	
GRE	3-5	
GWAR (Exam) or Class	0-5	
Additional Units		**0-1 units**

*A3, B1, B2, B3, B4, Theme 1, Theme 2 satisfied in major.
**Computer Engineering General Education ABET Reductions (see Notes).

Requirements for the Major in Computer Engineering

1. **Lower Division** (24 units):
   ECE 160, CMPS 150, 221, 223, 224, 295
2. **Upper Division required** (42 units):
   ECE 304, 307, 320, 321, 322, 360, 420, 490A, 490B
3. **Upper Division Electives ECE** (3 courses) (15 units):
   Choose one course from each of the three areas:
   Communications, Signal Processing, Networking:
   ECE 422, 423, 425, 426
   Embedded Systems, Computer Control, Robotics:
   ECE 457, 432
   Computer Vision and Image Processing:
   ECE 446, 447
4. **Cognate Requirements** (53 units):
   MATH 201, 202, 203, 204 or MATH 231, 232, 233, 234, MATH 230 or 330, and MATH 340, PHYS 221, 222, 223, PHYS or ENGR 207

General Education Courses and Notes:

- ECE 490A or 490B satisfies Theme 1.
- PHIL 316 must be taken and will satisfy Theme 2 and the Computer Engineering Ethics requirement.
- For Computer Engineering majors, A3 is waived.
- PHYS 221 will satisfy Areas B1 and B3.
- Area B2 is waived for Computer Engineering majors.
- For Computer Engineering majors, HIST 231 or 232 will (double) count for both 5 units of Area C as well as for American Institutions.
- The Computer Engineering ABET 3c. and 3h. Student Outcomes waive 5 units in Area D and waive 5 units of Theme 3.

Requirements for the Bachelor of Science Degree in Computer Engineering with a Concentration in Electrical Engineering (This concentration has been elevated to a Degree Program. Please see Electrical Engineering).

ELECTRICAL ENGINEERING

Department of Computer and Electrical Engineering and Computer Science
School of Natural Sciences, Mathematics, and Engineering
Department Chair: Melissa Danforth
Program Office: Science Building III, 317
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Website: www.cs.csubak.edu
Faculty: M. Danforth, S. Garcia, S. Jafarzadeh, W. Li, H. Mehrpouyan, T. Meyer, D. Meyers, L. Niu, M.Thomas, H. Wang, A. Wani

Program Description
Electrical Engineering is a large and expanding field which is concerned with the following fundamental areas: digital signal processing, semiconductor electronics, microprocessors and embedded systems, VSLI design, cyber-physical systems, data communications, energy systems and power electronics, transmission and distribution, RF and microwave, robotics and control system design, electromechanics and mechatronics, computer networks, digital design, image processing and computer vision. If computer science can be regarded to be on the information processing side of computer engineering, then electrical engineering can be regarded to be on the side which builds upon the fundamental physical properties of electricity and magnetism. Electrical engineers often work with other engineers, physical scientists, and computer scientists.

Requirements for the Bachelor of Science Degree in Electrical Engineering

Total Units Required to Graduate		**180 units**
Major Requirements		**133 units**
CMPS/ECE Courses	70	
Cognates (includes PHIL 316)	63	
Other University Requirements		**42-47 units**
CSUB 101	2	
American Institutions	5	
Area A	10*	
Area B	0*	
Area C	10	
Area D	10**	
Theme 1	0*	
Theme 2	0*	
Theme 3	0**	
GRE	5	
GWAR (Exam) or Class	0-5	
Additional Units		**0-5 units**

*A3, B1, B2, B3, B4, Theme 1, Theme 2 satisfied in major or cognate
**Electrical Engineering General Education ABET Reductions (see Notes)

Requirements for the Major in Electrical Engineering
1. **Lower Division** (14 units):
   ECE 160, CMPS 150, 221, 224
2. **Upper Division required** (41 units):
   ECE 304, 307, 320, 330, 332, 337, 423, 490A, 490B
3. **Upper Division Electives** (3 courses) (15 units):
   Select three courses from: ECE 306, 322, 336, 420, 422, 424, 425, 426, 432, 433, 434, 446, 447, 457, 464
4. **Cognate Requirements** (58 units):
   MATH 201 or 231, MATH 202 or 232, MATH 203 or 233, MATH 204 or 234, MATH 230 or 330, and MATH 340, CHEM 211, PHYS 221, 222, 223, PHYS/ENGR 207

General Education Courses and Notes:
- ECE 490A, 490B satisfies Theme 1.
- PHIL 316 must be taken and will satisfy Theme 2 and the Electrical Engineering Ethics requirement.
- For Electrical Engineering majors, A3 is substituted by PHYS/ENGR 207.
- PHYS 221 will satisfy Areas B1 and B3.
- Area B2 is waived for Electrical Engineering majors.
- For Electrical Engineering majors, HIST 231 or 232 will (double) count for both 5 units of Area C as well as for American Institutions.
- The Electrical Engineering ABET 3c. and 3h. Student Outcomes waive 5 units in Area D and waive 5 units of Theme 3.

COURSE DESCRIPTIONS
Note: All Computer Engineering and Electrical Engineering courses descriptions are listed under the Computer Engineering Degree Program and carry the ECE prefix.

2. 2016-18 Catalog Copy (Semesters)

COMPUTER ENGINEERING

Department of Computer and Electrical Engineering and Computer Science
School of Natural Sciences, Mathematics, and Engineering
Department Chair: Melissa Danforth
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Telephone: (661) 654-3082
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Faculty: A. Cruz, M. Danforth, S. Garcia, S. Jafarzadeh, W. Li, H. Mehrpoyan, T. Meyer, D. Meyers, M. Thomas, V. Vakilian, H. Wang, A. Wani

Program Description
Computer Engineering is a field, which in some sense, resides between the long-established fields of Computer Science and Electrical Engineering. It is concerned with topics such as analog and digital circuit design, embedded controllers, computer hardware, system software, computer system design, data communication, signal processing, computer networks, robotics, computer vision, graphics and image processing, and other topics in computing where hardware plays an important role. Computer engineers often work with other engineers, physical scientists, and software engineers.

The Computer and Electrical Engineering and Computer Science Department moved into a new building in Fall 2008. The department administers its own local area network which includes multiple Unix/Linux servers, two software programming labs, a walk-in lab/tutoring center, one advanced workstation lab, an isolated network lab, an AI/visualization lab, a DSP/communications lab, one digital electronics hardware lab, a power systems/electronics lab, and a robotics/control systems lab. There is also a department library/major study room with computers available to students.

An important goal of the department is to enable students to work much more closely with faculty than they would be able to at larger universities. A detailed description of student learning goals and objectives can be found at http://www.cs.csub.edu/all_abet.pdf.

Requirements for the Bachelor of Science Degree in Computer Engineering

Total Units Required to Graduate	**120 units**
Major Requirements	**95 units**
ECE/CMPS Courses	64
Cognate Courses	31
Minor Requirement	**0 units**
General Education Requirements	**24 units**
First-Year Seminar	0*
LD Area A Foundational Skills	6*
LD Area B Natural Sciences	0*
LD Area C Arts and Humanities	6
LD Area D Social and Behavioral Sciences	3*
American Institutions	6
SELF	0**
Junior Year Diversity Requirement	3
UD Thematic Areas C and D	0*
Capstone	0*
GWAR (Exam) or Class	0**
Additional Units	**1 unit*** **

*The following required major courses also meet general education requirements: ECE/ENGR 1618 and 1628 meet First-year Seminar, MATH 2310 or 2510 meets Foundational Skill A4, PHYS 2210 meets LD Area B1, PHIL 3318 meets UD Thematic Area C, and CMPS 4928 meets Capstone. Engineering majors have the following GE modifications: Foundational Skill A3, LD Area B2, 3 units of LD Area D, and UD Thematic Area D.
**The SELF requirement may be met by selecting another General Education course with a SELF overlay or by taking a stand-alone course. The GWAR may be satisfied by taking the GWAR exam, by taking another General Education course with a GWAR overlay, or by taking a stand-alone course. If a student opts to take a stand-alone course for either or both of these requirements, the course(s) will add additional units to that student's general education pathway.
***Additional Units are required to meet the 120-unit requirement for graduation. Any accepted university units may be used to meet this requirement, including stand-alone courses for SELF and GWAR.

SB1440 units required - 58 units*
*Units required for graduation after completion of the Engineering (Computer Engineering focus) model curriculum and lower-division general education at a California community college.

Note: One (1) semester unit of credit normally represents one hour of in-class work and 2-3 hours of outside study per week.

Academic Regulation
A grade of C- is the minimal grade acceptable for progression in the CMPS 2010 and 2020 sequence.

Requirements for the Major in Computer Engineering
1. **Lower Division** (20 units)
   ECE/ENGR 1618, 1628, ECE/ENGR/PHYS 2070, CMPS 2010, 2020, 2120
2. **Upper Division** (32 units)
   CMPS 3240, 3600, ECE 3040, 3070, 3200, 3220, 3250, 4910, 4928
3. **Upper Division Elective courses** (12 units)
   Select 12 units of electives from the following:
   Digital Communications and Signal Processing:
   ECE 3230, 4220, 4250, 4260
   Control Systems, Robotics, and Digital Design:
   ECE 3280, 4240, 4570
   Image Processing and Computer Vision:
   ECE 4460, 4470

Special Topics and Independent Study
ECE 3770, 3771, 4770, 4771, 4800, 4860, 4870, 4890
Only a combined total of 4 units of ECE 377x, 477x, 48xx may be used for elective credit.

4. **Required Cognate courses** (31 units)
MATH 2510 or 2310, MATH 2520 or 2320, MATH 2530, 2610, 3200, PHYS 2210, 2220, PHIL 3318
5. **General Education Courses and Notes:**
Some of the courses required for the Computer Engineering major also satisfy General Education requirements. Students who complete each of these courses with the appropriate grade will also satisfy the GE requirement, even if they were to change majors:
   - ECE/ENGR 1618 and 1628 satisfy the First-year Seminar requirement.
   - ECE 4928 satisfies the Capstone requirement.
   - PHIL 3318 satisfies UD Thematic Area C and the Computer Engineering Ethics requirement.
   - PHYS 2210 satisfies LD Areas B1.
   - MATH 2510 or 2310 with a grade of C or better satisfies Foundational Skill A4.

Engineering majors have the following General Education Modifications (GEMs), which means they do not have to take courses to satisfy these GE requirements. These GEMs are specific to the three engineering majors (Computer Engineering, Electrical Engineering and Engineering Sciences). Students who change to another major will not keep the modifications:

- Foundational Skill A3 is embedded in PHYS 2210, 2220 and ECE/ENGR/PHYS 2070.
- LD Area B2 is embedded throughout the curriculum.
- 3 units of LD Area D is met through EAC/ABET outcomes 3c and 3h.
- UD Thematic Area D is met through EAC/ABET outcomes 3c and 3h.

Note: Several of the courses required for Computer Engineering are listed under the Computer Science Degree Program (CMPS prefix). Additionally, all Computer Engineering and Electrical Engineering courses descriptions are listed under the Computer Engineering Degree Program and carry the ECE prefix.

ELECTRICAL ENGINEERING

Department of Computer and Electrical Engineering and Computer Science
School of Natural Sciences, Mathematics, and Engineering
Department Chair: Melissa Danforth
Program Office: Science Building III, 317
Telephone: (661) 654-3082
email: ceecs@cs.csubak.edu
Website: www.cs.csubak.edu
Faculty: A. Cruz, M. Danforth, S. Garcia, S. Jafarzadeh, W. Li, H. Mehrpouyan, T. Meyer, D. Meyers, M.Thomas, V. Vakilian, H. Wang, A. Wani

Program Description
Electrical Engineering is a large and expanding field which is concerned with the following fundamental areas: digital signal processing, semiconductor electronics, microprocessors and embedded systems, VSLI design, cyber-physical systems, data communications, energy systems and power electronics, transmission and distribution, RF and microwave, robotics and control system design, electromechanics and mechatronics, computer networks, digital design, image processing and computer vision. If computer science can be regarded to be on the information processing side of computer engineering, then electrical engineering can be regarded to be on the side which builds upon the fundamental physical properties of electricity and magnetism. Electrical engineers often work with other engineers, physical scientists, and computer scientists.

The Computer and Electrical Engineering and Computer Science Department moved into a new building in Fall 2008. The department administers its own local area network which includes multiple Unix/Linux servers, two software programming labs, a walk-in lab/tutoring center, one advanced workstation lab, an isolated network lab, an AI/visualization lab, a DSP/communications lab, one digital electronics hardware lab, a power systems/electronics lab, and a robotics/control systems lab. There is also a department library/major study room with computers available to students.

An important goal of the department is to enable students to work much more closely with faculty than they would be able to at larger universities. A detailed description of student learning goals and objectives can be found at http://www.cs.csub.edu/all_abet.pdf.

Requirements for the Bachelor of Science Degree in Electrical Engineering

Total Units Required to Graduate	**120 units**
Major Requirements	**90 units**
CMPS/ECE Courses	56
Cognate Courses	34
Minor Requirement	**0 units**
General Education Requirements	**24 units**
First-Year Seminar	0*
LD Area A Foundational Skills	6*
LD Area B Natural Sciences	0*
LD Area C Arts and Humanities	6
LD Area D Social and Behavioral Sciences	3*
American Institutions	6
SELF	0**
Junior Year Diversity Requirement	3
UD Thematic Areas C and D	0*
Capstone	0*
GWAR (Exam) or Class	0**
Additional Units	**6 units*** **

*The following required major courses also meet general education requirements: ECE/ENGR 1618 and 1628 meet First-year Seminar, MATH 2310 or 2510 meets Foundational Skill A4, PHYS 2210 meets LD Area B1, PHIL 3318 meets UD Thematic Area C, and CMPS 4928 meets Capstone. Engineering majors have the following GE modifications: Foundational Skill A3, LD Area B2, 3 units of LD Area D, and UD Thematic Area D.
**The SELF requirement can be met by selecting another General Education course with a SELF overlay or by taking a stand-alone course. The GWAR may be satisfied by taking the GWAR exam, by taking another General Education course with a GWAR overlay, or by taking a stand-alone course. If a student opts to take a stand-alone course for either or both of these requirements, the course(s) will add additional units to that student's general education pathway.
***Additional Units are required to meet the 120-unit requirement for graduation. Any accepted university units may be used to meet this requirement, including stand-alone courses for SELF and GWAR.

SB1440 units required - 58 units*
*Units required for graduation after completion of the Engineering (Electrical Engineering focus) model curriculum and lower-division general education at a California community college.

Note: One (1) semester unit of credit normally represents one hour of in-class work and 2-3 hours of outside study per week.

ELECTRICAL ENGINEERING

Requirements for the Major in Electrical Engineering

1. **Lower Division** (12 units)
   ECE/ENGR 1618, 1628, ENGR/ECE/PHYS 2070, CMPS 2010
2. **Upper Division** (32 units)
   ECE 3040, 3070, 3200, 3230, 3320, 3370, 3340, 4910, 4928
3. **Upper Division Elective courses** (12 units)
   Select 12 units of elective courses from the following. At least one course must be at the 4000-level:
   Digital Design and Embedded Systems
   ECE 3220, 3250, 4240
   Digital Communication and Digital Signal Processing
   ECE 4220, 4250, 4260
   Control Systems and Robotics
   ECE 3280, 4570
   Power Systems and Power Electronics
   ECE 3380, 4330, 4370
   Image Processing and Computer Vision
   ECE 4460, 4470
   Special Topics and Independent Study
   ECE 3770, 3771, 4770, 4771, 4800, 4860, 4870, 4890
   Only a combined total of 4 units of ECE 377x, 477x, 48xx may be used for elective credit.
4. **Required Cognate courses** (36 units):
   MATH 2510 or 2310, MATH 2520 or 2320, MATH 2530, 2610, 3200, CHEM 1000, PHYS 2210, 2220, PHIL 3318
5. **General Education Courses and Notes:**
   Some of the courses required for the Electrical Engineering major also satisfy General Education requirements. Students who complete each of these courses with the appropriate grade will also satisfy the GE requirement, even if they were to change majors:
   - ECE/ENGR 1618 and 1628 satisfy the First-Year Seminar requirement.
   - ECE 4928 satisfies the Capstone requirement.
   - PHIL 3318 satisfies UD Thematic Area C and the Electrical Engineering Ethics requirement.
   - PHYS 2210 satisfies LD Areas B1.
   - MATH 2510 or 2310 with a grade of C or better satisfies Foundational Skill A4.

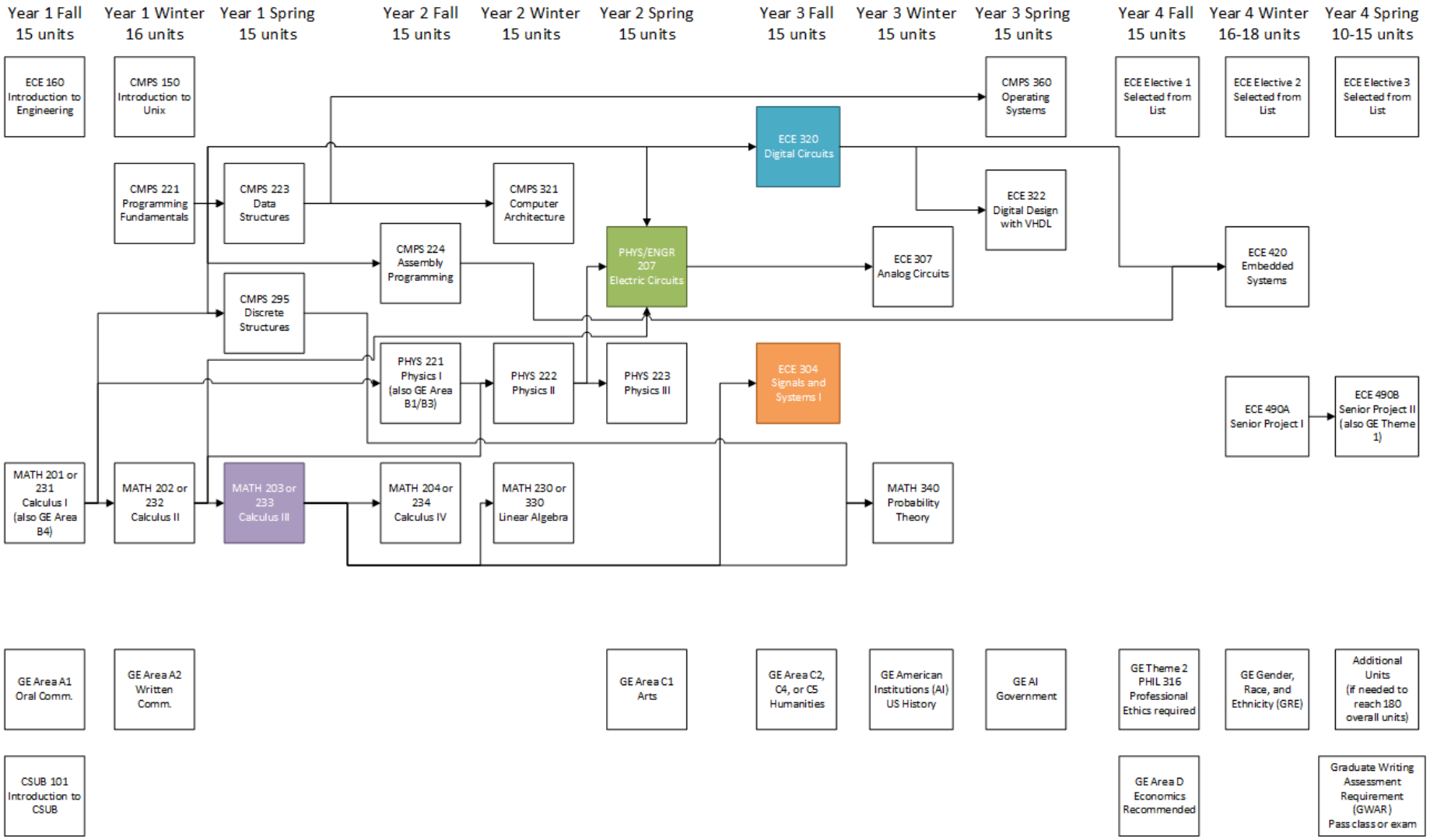
Engineering majors have the following General Education Modifications (GEMs), which means they do not have to take courses to satisfy these GE requirements. These GEMs are specific to the three engineering majors (Computer Engineering, Electrical Engineering and Engineering Sciences). Students who change to another major will not keep the modifications:

- Foundational Skill A3 is embedded in PHYS 2210, 2220 and ECE/ENGR/PHYS 2070.
- LD Area B2 is embedded throughout the curriculum.
- 3 units of LD Area D is met through EAC/ABET outcomes 3c and 3h.
- UD Thematic Area D is met through EAC/ABET outcomes 3c and 3h.

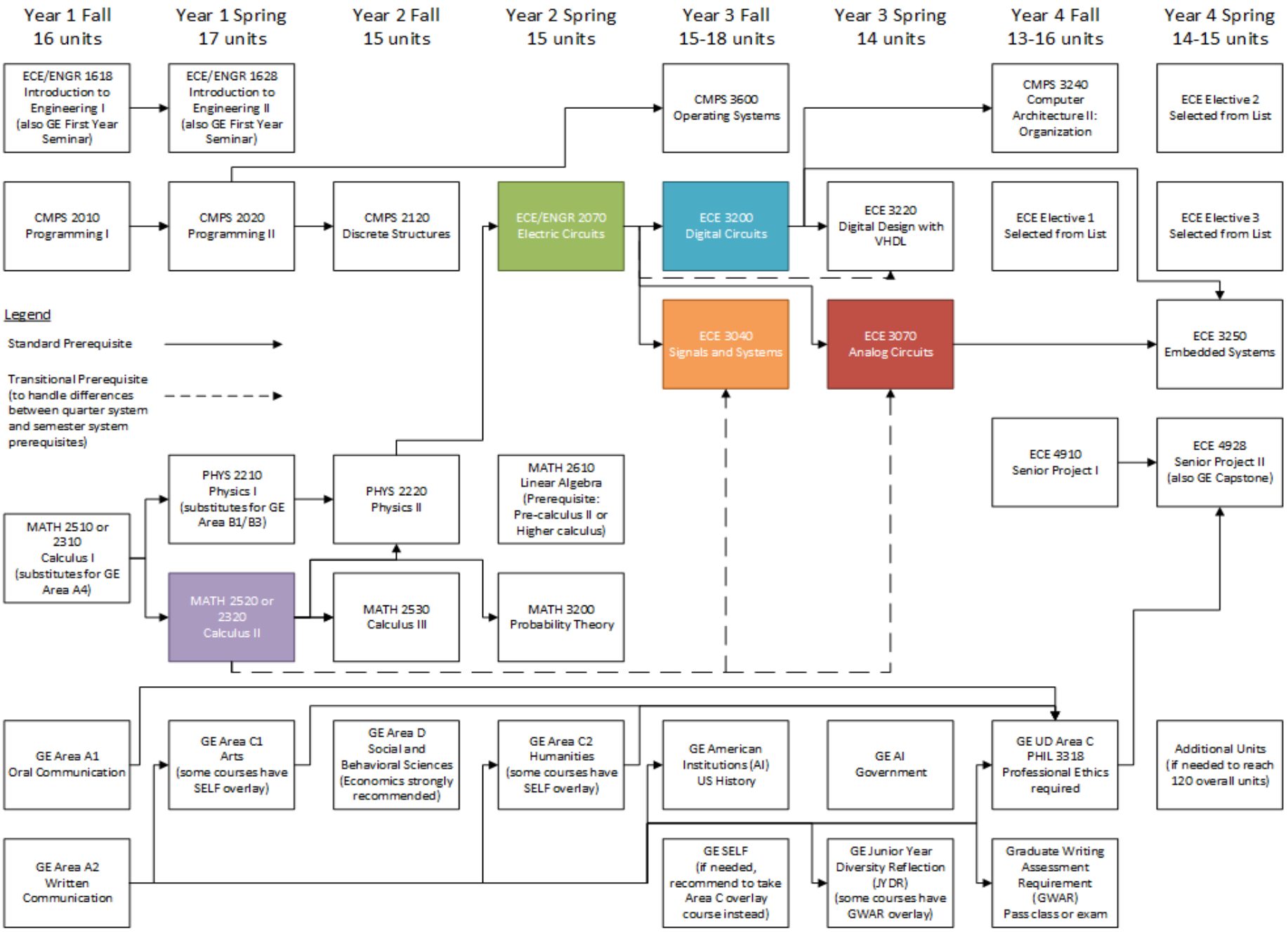
Note: All Computer Engineering and Electrical Engineering **courses descriptions** are listed under the Computer Engineering Degree Program and carry the ECE prefix.

C. Roadmaps to Graduation

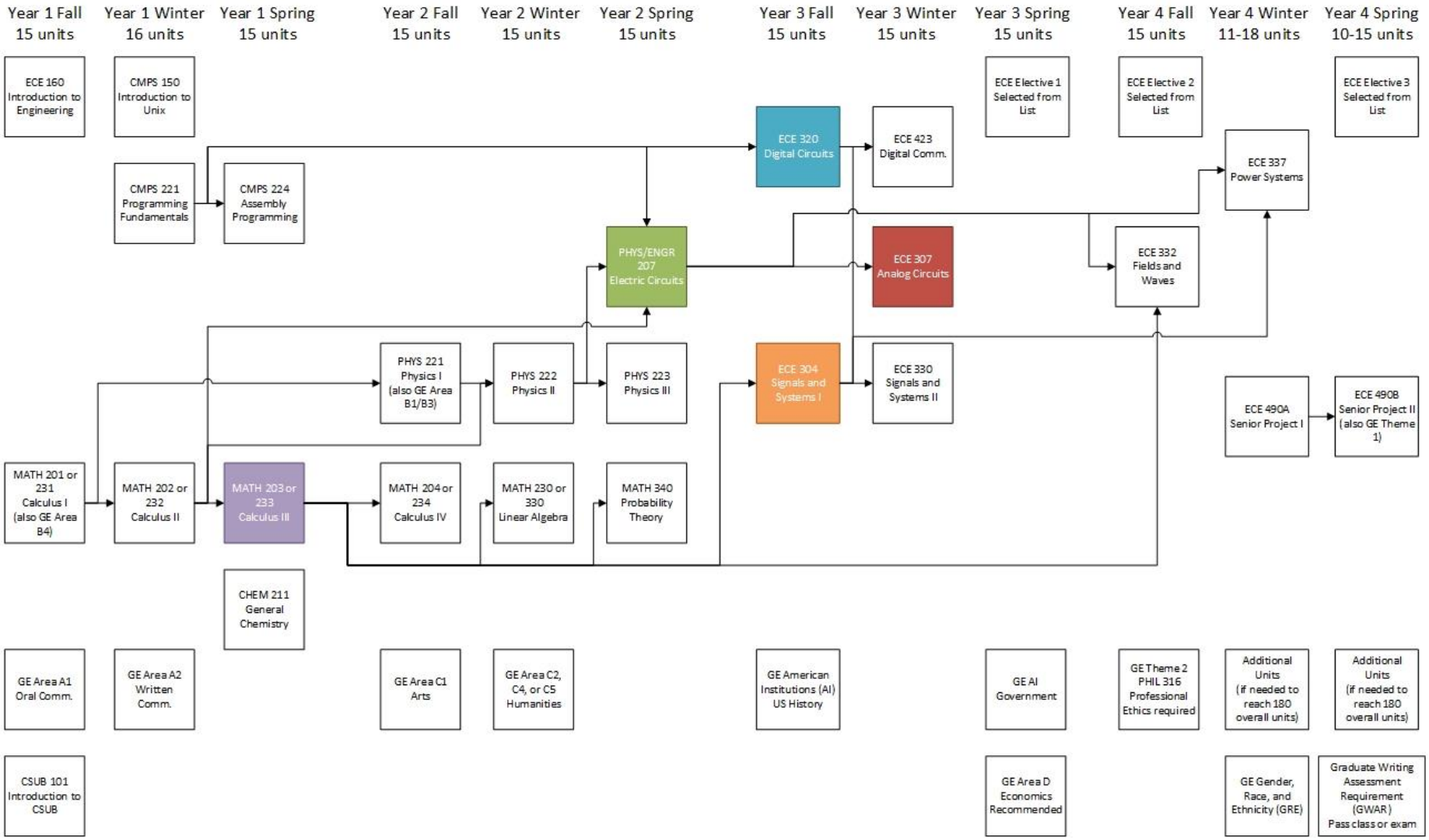
1. 2013-15 Roadmap for Computer Engineering (Quarter System)



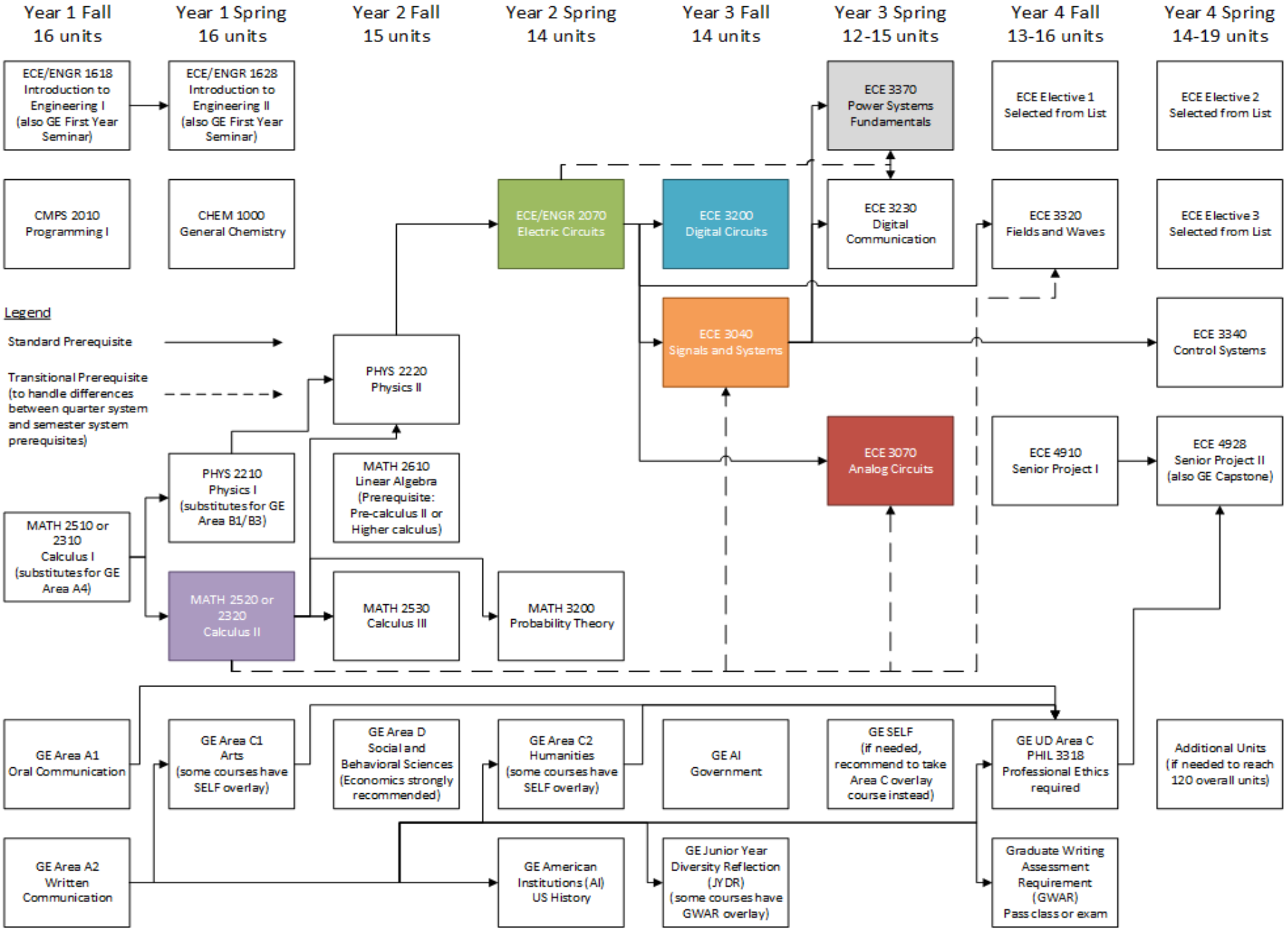
2. 2016-18 Roadmap for Computer Engineering (Semester System)



3. 2013-15 Roadmap for Electrical Engineering (Quarter System)



4. 2016-18 Roadmap for Electrical Engineering (Semester System)



D. Faculty Brief Vitae

Brief faculty CVs for all full-time and part-time faculty are provided in this section. The CVs are formatted in ABET CV format, with highlights of publications, grants, and other activities instead of a complete listing of such activities.

Tenured / Tenure-Track Faculty:

- Reza Abdolee
- Anthony Bianchi
- Alberto Cruz
- Melissa Danforth (Chair)
- Saeed Jafarzadeh
- Chengwei Lei
- Wei Li
- Vida Vakilian
- Huaqing Wang

Full-Time Lecturers:

- J. Antonio Cardenas-Haro
- Gordon Griesel
- Derrick McKee
- Ehsan Reihani

Part-Time Lecturers:

- Steven Garcia (also FT staff)
- Weiguo “James” Luo
- M. Jay Manibo
- Walter Morales
- Edward Rangel
- Michael Sarr

Reza Abdolee

Education

Ph.D. 2009-2014	Electrical Engineering	McGill University, Canada
M.S. 2005-2007	Electrical Engineering	University Technology Malaysia
B.S. 1995-1999	Electrical Engineering	Azad University, Arak, Iran

Academic Experience

- Sept. 2016 – Present: Assistant Professor, Dept. of Comp. and Elec. Eng. & Comp. Science, California State University, Bakersfield, United States, Full Time
  Teaching courses in Electrical Engineering, e.g., Digital Communications, Analog Circuits, Wireless Communications. Conducting research, Supervising undergraduate research projects, Assisting with obtaining ABET accreditation for department engineering programs.
- Sept. 2009 - Oct. 2014: System Engineer, Telecommunication and Signal Processing (TSP) Lab, McGill University, Montreal, Canada
  Communication system modeling and simulations, data analysis, development of distributed computational algorithms for multi-node processing systems, Statistical analysis and performance evaluation and optimization of parallel digital systems, Communication system analysis, cross-layer design, and development of MAC protocol/networking.

Non-Academic Experience

- **May. 2015 - Sept.2016: Digital System Engineer,** Qualcomm Inc., San Diego, United States
  Digital system modeling and verification. Fixed point implementation of signal processing algorithms in C/C++. ASIC design verification in SystemC and System Verilog. HW-SW co-verification, testbench automation, industry standard bug tracking, and regression testing mechanisms.
- **Aug. 2012 - Dec. 2012: Intern**, Bell Labs, Alcatel-Lucent Company, Stuttgart, Germany
  Algorithm development and modeling. Mobility modeling and prediction. Design and implementation of a distributed localization and tracking algorithm for digital communication systems.
- **Sept. 2008 - Aug. 2009: Wireless System Engineer,** DSP Lab, Concordia University, Montreal, Canada
  MIMO system modeling and algorithm development, developing of channel estimation algorithms for LTE systems, data modeling and analysis.
- **Dec. 2006 - June. 2008: Hardware Engineer**, Wireless Communication Lab, (UTM), Malaysia
  Design and implementation of a switch-beam smart antenna system using DSP and FPGA platforms. The project involved algorithm development, MATLAB modeling and simulation, C++ programing, VHDL programing and implementation, DSP & FPGA integration, RF and Microwave design and modeling, antenna design and implementation, data measurement and analysis, system verification and testing.
- **Jan. 2003 - Apr. 2005: Electrical Engineer**, Padideh Pooyan, Tehran, Iran
  Microcontroller/Microprocessor system design and fabrication, analog circuit design and repair, PCB layout design and fabrication for electronic control board of industrial machineries.
- **Oct. 2001 - Dec. 2003: Electronic Engineer**, SUPA Factory, Karaj, Iran
  Maintenance and installation of electrical and electronic control machine, Microcontroller/ Microprocessor system design and fabrication, Analog circuit design and repair, PCB design and fabrication for industrial machineries. PLC and microcontroller programing.

Certifications or Professional Registrations

- None

Memberships in Professional Organizations

- IEEE

Honors and Awards

- **International:** DAAD-RISE International Internship Award, Bell Lab, Germany, 2012
- **International:** International Doctoral Award (MIDA), McGill University, 2009-2014
- **National:** NSERC Postgraduate Scholarship, McGill University, 2011-2013
- **Provincial:** FQRNT International internship award, McGill University, 2010-2013
- **Provincial:** ReSMiQ Doctoral Scholarship, Concordia University, Montreal, Canada
- **Institutional:** Graduate Research Enhancement and Travel Award, McGill University, 2010-2013
- **Institutional:** Graduate Funding and Travel Award, McGill University, 2010-2014
- **Institutional:** Graduate Research Mobility Award, McGill University, 2010-2014

Selected Service Activities

- **Vice Chair** of McGill IEEE Student Branch
- **Author** of more than 20 journal and conference papers, including highly recognized IEEE Transactions Journals.
- **Teaching Assistant** at McGill and Concordia University
- **Reviewer** of "IEEE Transaction on Signal Processing" Journal, "Circuits, Systems and Signal Processing" and "IET Signal Processing" Journals, "Wireless Communication and Signal Processing" (WCSP) conference, "Vehicular Technology Conference" (VTC) conference.

Selected Publications and Presentations

- R. Abdolee, V. Vakilian, "Optimal Combination Weights for Diffusion LMS over Multi-Agent Networks", IEEE Journal of Internet of Things, Under review since May 2016.
- R. Abdolee, V. Vakilian, B. Champagne, "Tracking Performance and Optimal Step-Sizes of Diffusion LMS Algorithms in Nonstationary Signal Environment", IEEE Transaction on Control of Network Systems, Feb. 2016.
- R. Abdolee, and B. Champagne "Centralized Adaptation for Parameter Estimation over Wireless Sensor
- Networks", *IEEE Communications Letters*, Vol. 19, No. 9, pp 1624 - 1627, Sept. 2015
- R. Abdolee, B. Champagne and A. H. Sayed, "Diffusion Adaptation over Multi-Agent Networks with Wireless Link Impairments", *IEEE Transaction on Mobile Computing*, July 2015.
- R. Abdolee, B. Champagne and A. H. Sayed, "Estimation of Space-Time Varying Parameters Using a Diffusion LMS Algorithm", *IEEE Transaction on Signal Proc.*, Vol. 62, No. 2, pp 403–418 Jan. 2014.

Professional Development Activities

- None

Anthony Bianchi

Education

Ph.D. September 2014	Electrical Engineering	University of California, Riverside
M.S. December 2010	Electrical Engineering	University of California, Riverside
B.S. June 2008	Electrical Engineering	California State University, Pomona

Academic Experience

- California State University, Bakersfield, Assistant Professor, August 2016 to present, Full Time
- University of California, Riverside, Teaching Assistant, September 2012 to March 2014

Non-Academic Experience

- Albert Einstein College of Medicine, Post-Doctoral Research Fellow, Carried out experimental design and In vivo acquisition of mice for study of TMEM in mice. Design of perfusion MRI protocol. Software/algorithm development including GUI design. February 2015 to August 2016. Full Time
- General Electric Global Research, Graduate Research & Development Intern in the Biomedical Image Analysis Lab, Development of state of the art tumor segmentation algorithms, implemented in efficiently programmed multi-threaded C++. Participated in interdepartmental presentations and demonstrations. A portion of the work was published in IEEE ISBI 2013 and selected as a lecture presentation. June 2012 to September 2012. Full Time
- Fire Sentry Corporation, Electronic Engineer, Tasks included: Repaired prototype high technology electro-optical flame/fire detectors and associated control panels and accessories. Created technical documentation for internal engineering records and third-party approval agencies. Conducted comprehensive experimental testing and research for new products. Provided technical business representation at trade shows and customer meetings. January 2004 to January 2012, Full and Part Time

Certifications or Professional Registrations

- None

Memberships in Professional Organizations

- IEEE Member, IEEE Computer Society, IEEE Signal Processing Society
- Tae Beta Pi – National Engineering Honors Society
- Eta Kappa Nu (HKN) – National Electrical Engineering Honors Society

Honors and Awards

- Fellowship, NSF Integrative Graduate Education and Research Traineeship (IGERT) in Video Bioinformatics, inaugural class, 2010
- East Asia and Pacific Summer Institutes (EAPSI), Taiwan Grant (Principle Investigator), 2009
- University of California, Riverside Fellowship under NSF grant "Learning Concepts in Morphological Image Databases", 2008
- Bioengineering Research Institute for Technical Excellence (BRITE), University of California, Riverside. Research Experiences for Undergraduates Summer Program, 2007

Selected Service Activities

- Conference Staff for IEEE Conference on Distributed Smart Cameras 2013
- Reviewer for IEEE Sensors Journal, Elsevier Pattern Recognition

- Unofficial Reviewer for CVPR, ICIP, ICPR

Selected Publications and Presentations

- A. Bianchi, B. Bhanu, A. Obenaus, "Dynamic Low-Level Context for the Detection of Mild Traumatic Brain Injury," IEEE Transactions on Biomedical Engineering, 2014.
- A. Bianchi, B. Bhanu, V. Donovan, and A. Obenaus, "Visual and contextual modeling for the detection of repeated mild traumatic brain injury," IEEE Transactions on Medical Imaging. Vol. 33, No. 1, January 2014.
- V. Donovan, A. Bianchi, R. Hartman, B. Bhanu, M.J. Carson, A. Obenaus, "Computational analysis reveals increased blood deposition following repeated mild traumatic brain injury," NeuroImage Clinical, Vol. 1, No. 1, September 2012.
- A. Bianchi, B. Bhanu, A. Obenaus, "Multi-Modal Specific Features for Detection of Mild Traumatic Brain Injury," Medical Image Analysis, *In Review 2014.*
- A. Bianchi, B. Bhanu, A. Obenaus, "High and Low Level Contextual Modeling for the Detection of Mild Traumatic Brain Injury" in Video Bioinformatics, B. Bhanu and P. Talbot, Eds. New York, NY. 2014. Accepted, in editing.
- A. Bianchi, B. Bhanu, V. Donovan and A. Obenaus, "Detecting mild traumatic brain injury using dynamic low level context," IEEE International Conference on Image Processing, Melbourne, Australia, Sept. 15-18, 2013.
- A. Bianchi, J. V. Miller, E. T. Tan, A. Montillo, "Brain tumor segmentation with symmetric texture and symmetric intensity-based decision forests" IEEE International Symposium on Biomedical Imaging, San Francisco, CA, April 2013. (selected for Oral Presentation 18.9% acceptance rate.)
- A. Bianchi, B. Bhanu, V. Donovan, A. Obenaus, "Contextual and Visual Modeling for Detection of Mild Traumatic Brain Injury in MRI," IEEE International Conference on Image Processing, Orlando, FL, October 2012.
- G. Harlow, A. Cruz, L. Shuo, N. Thakoor, A. Bianchi, J. Chen, B. Bhanu, Z. Yang, "Automated spatial analysis of ARK2: Putative link between ROP signaling and microtubules," IEEE International Symposium on Biomedical Imaging, San Francisco, CA, April 2013.
- A. Bianchi, B. Bhanu and Y. Sun, "Image retrieval of highly similar objects," ICPR Workshop on Analysis and Evaluation of Large Scale Multimedia Collection, August 22, 2010, held in conjunction with International Conference on Pattern Recognition, Istanbul, Turkey, August 23-26, 2010. **Peer Reviewed**
- S. Ashwal, J.S. Coats, A. Bianchi, B. Bhanu and A. Obenaus, "Semi-automated segmentation of ADC maps reliably defines ischemic perinatal stroke injury," Sixth Hershey Conference on Developmental Brain Injury. June 4-7, 2008, Ecquevilly, France.

Professional Development Activities

- Ethics Across the Curriculum Workshop

Albert C. Cruz

Education

Ph.D. December 2014	Electrical Engineering	University of California, Riverside
M.S. December 2010	Electrical Engineering	University of California, Riverside
B.S. June 2008	Electrical Engineering	California State University, Riverside

Academic Experience

- Sep. 2015 – Present, Assistant Professor, California State University, Bakersfield, Department of Computer & Electrical Engineering & Computer Science. Full Time.
- Sep. 2014 – Aug. 2015, Lecturer, California State University, Bakersfield, Department of Computer & Electrical Engineering & Computer Science, Full Time.

Non-Academic Experience

- None

Certifications or Professional Registrations

- None

Memberships in Professional Organizations

- ASABE, IEEE, ACM

Honors and Awards

- DoD Research and Education Program, HBCU/MI Equipment/Instrumentation FY 2016
  Title: Acquisition of a Micro-CT for Multi-Disciplinary Research, Teaching, and STEM Outreach at California State University, Bakersfield
  PI: Brandon Pratt Key Personnel: Alberto C. Cruz Submitted December 2015
- CSUB Research Council of the University Faculty Mini-grant Program
  Title: Thermographic Analysis of Photovoltaics (TAP) Accepted June 2015
  6 mo. funding of $4,992 PI: Alberto C. Cruz Co-PI: Saeed Jafarzadeh
- CSUB CERC Student Faculty Research Grant Program 2015 Round One
  Title: Thermographic Real-time Preventative Measures in Power Systems
  Accepted April 2015 3 mo. funding of $3,500 PI: Alberto C. Cruz

Selected Service Activities

- Finance Co-Chair: IEEE Conf. on Automatic Face and Gesture Recognition
- Program Committee: IEEE Conf. on Tools with Artificial Intelligence

Selected Publications and Presentations

- Cruz, B. Bhanu and N. S. Thakoor, "Background suppressing Gabor energy filtering," Pattern Recognition Letters, vol. 52, pp. 40-47, 2015. doi: 10.1016/j.patrec.2014.10.001.
- A. Cruz, B. Bhanu and N. S. Thakoor, "Vision and attention theory based sampling for continuous facial emotion recognition," IEEE Trans. Affective Computing, vol. 5, no. 4, pp. 418-431, 2014. doi: 10.1109/TAFFC.2014.231615.
- Cruz, B. Bhanu and B. Le, "Human Automotive Interaction: Affect Recognition for Motor Trend Magazine's Best Driver Car of the Year," in Emotion and Attention Recognition Based on Biological Signals and Images, S. A. Hosseini, Ed. InTech, 2016.
- A. Cruz, B. Bhanu and N. S. Thakoor, "Understanding of the biological process of non-verbal communication: facial emotion and expression recognition," in Video Bioinformatics: From Live Imaging to Knowledge (Springer Series on Computational Biology, vol. 22), B. Bhanu and P. Talbot, Eds. Springer, 2015. doi: 10.1007/978-3-319-23724-4.
- I. E. Cabrera, A. L. Tambo, A. Cruz, B. X. Guan, B. Bhanu and K. A. Borkovich, "Quantitative analyses during growth and development in the filamentous fungus Neurospora Crassa," in Video Bioinformatics: From Live Imaging to Knowledge (Springer Series on

Computational Biology, vol. 22), B. Bhanu and P. Talbot, Eds. Springer, 2015. doi: 10.1007/978-3-319-23724-4.
- N. S. Thakoor, A. Cruz and B. Bhanu, "Video bioinformatics databases and software," in Video Bioinformatics: From Live Imaging to Knowledge (Springer Series on Computational Biology, vol. 22), B. Bhanu and P. Talbot, Eds. Springer, 2015. doi: 10.1007/978-3-319-23724-4.
- A. Rinaldi and A. Cruz, "Facial Emotion Recognition for Motor Vehicle Operators," The 20th International Conference on Image Processing, Computer Vision, and Pattern Recognition, 2016.
- Christian T. Michael and A. Cruz, "Approximating Neuron Activity via Lifetime Charge in Artificial Neural Networks," 28th Annual CSU Biotechnology Symposium, 2016.
- G. Hasta and A. Cruz, "Deep Context Injection for Super-resolution," The 20th International Conference on Image Processing, Computer Vision, and Pattern Recognition, 2016.
- A. Cruz, "Quantification of Cinematography Semiotics for Video-based Facial Emotion Recognition in the EmotiW 2015 Grand Challenge," in Proceedings of the 2015 ACM on International Conference on Multimodal Interaction, 2015. doi: 0.1145/2818346.2830592.
- A. Cruz, B. Bhanu and N. S. Thakoor, "One shot emotion scores for facial emotion recognition," in 2014 IEEE International Conference on Image Processing (ICIP), 2014. doi: 10.1109/ICIP.2014.7025275.
- G. Harlow, A. Cruz, L. Shuo, N. Thakoor, A. Bianchi, J. Chen, B. Bhanu and Z. Yang, "Automated spatial analysis of ARK2: A key microtubule and cell polarity link," in 2013 IEEE 10th International Symposium on Biomedical Imaging (ISBI), 2013. doi: 10.1109/ISBI.2013.6556623.
- A. Cruz, B. Bhanu and N. Thakoor, "Facial emotion recognition with anisotropic inhibited Gabor energy histograms," in 2013 20th IEEE International Conference on Image Processing (ICIP), 2013. doi: 10.1109/ICIP.2013.6738868.
- G. Harlow, A. Cruz, B. Bhanu, Z. Yang, S. Li, N. Thakoor, A. C. Bianchi, and J. Chen, "Videobioinformatics: Automatic 3D pavement cell analysis," in NSF IGERT Poster and Video Competition, 2013.
- G. Harlow, S. Li, A. Cruz, J. Chen and Z. Yang, "Visualizing leaf cells from within," in NSF 2013 International Science & Engineering Visualization Challenge, 2013.
- A. Cruz, B. Bhanu and N. Thakoor, "Facial emotion recognition in continuous video," in 2012 21st International Conference on Pattern Recognition (ICPR), 2012.
- A. Cruz, B. Bhanu and N. Thakoor, "Facial emotion recognition with expression energy," in Proceedings of the 14th ACM international conference on Multimodal interaction, 2012. doi: 10.1145/2388676.2388777.
- A. Cruz and B. Bhanu, "A biologically inspired approach for fusing facial expression and appearance for emotion recognition," in 2012 19th IEEE International Conference on Image Processing (ICIP), 2012. doi:10.1109/ICIP.2012.6467437.
- A. Cruz, B. Bhanu and S. Yang, "A psychologically inspired match-score fusion model for video-based facial expression recognition," in Affective Computing and Intelligent Interaction, 2011.

Professional Development Activities

- None

Melissa Danforth

Education

Ph.D. September 2006	Computer Science	University of California, Davis
M.S. March 2002	Computer Science	University of California, Davis
B.S. June 1999	Computer Science and Biology	California State Univ., Bakersfield

Academic Experience

- California State University, Bakersfield. Chair (Jul. 2014 – present), Interim Chair (Dec. 2013 – Jun. 2014), Associate Professor (Sep. 2012 – present), Assistant Professor (Sep. 2006 – Aug. 2012), Lecturer (Jan. 2006 – Aug. 2006). Full-time in all positions.
- University of California, Davis. Graduate Student Researcher (Jul. 2003 – Dec. 2005); Research Assistant (Jun. 2001 – Jun. 2002); Teaching Assistant (Sep. 2000 – Jun. 2001).

Non-Academic Experience

- NetSquared Inc., Researcher (Jun. 2002 – Jun. 2003). Researched machine learning algorithms and artificial immune systems for cyber security as part of an IRPA research project for the company. Part-time while working on Ph.D. dissertation at UC, Davis.
- Customsoft Inc., Network and Applications Specialist (Nov. 1998 – Aug. 2000). Programming and maintenance of predictive dialer application and system administration of corporate network. Part-time Nov. 1998 – Jun. 1999. Full-time Jun. 1999 – Aug. 2000.

Certifications or Professional Registrations

- None

Memberships in Professional Organizations

- Association for Computing Machinery (ACM). ACM special interest groups for Genetic and Evolutionary Computation (SIGEVO) and Security, Audit, and Control (SIGSAC).
- USENIX: The Advanced Computing Systems Association. USENIX special interest group for Sysadmins (LISA).
- American Society of Engineering Education (ASEE). ASEE Women in Engineering Division (WIED).
- Association for Practical and Professional Ethics (APPE).

Honors and Awards

- Engineering Coordinator/co-PD, U.S. Dept. of Ed. Title V grant (P031S150037), 2015 – 2020, $3.2 million.
- Co-PI, NSF IUSE grant (DUE 1430398), 2014 – 2017, $1 million.
- PD/PI, U.S. Dept. of Ed. Title V grant (P031S100081), 2010 – 2016 (no-cost extension), $3.8 million. Took over as Project Director in Feb. 2014.
- Co-PD, U.S. Dept. of Ed. MSEIP grant (P120A140051), 2014 – 2017, $734,735.
- PI, NSF Cyber Service SFS grant (DUE 1241636), 2012 – 2015. $267,351.
- Co-PD, U.S. Dept. of Ed. MSEIP grant (P120A110050), 2011 – 2014, $725,641.

Selected Service Activities

- Academic Affairs Committee of the CSUB Academic Senate (Fall 2016 – present).
- Board of Directors for Empower With Code (EWC) (Summer 2016 – present).
- Program Committee for 2016 USENIX Summit for Educators in System Administration.
- CSUB's Information Technology Advisory Committee (Fall 2015 – present).

- Editorial Board for USENIX Journal of Education in System Administration (Fall 2015 – present).
- Faculty Advisory Committee for Global Intelligence and National Security pilot program (Winter 2010 – committee discontinued).
- NSME Curriculum Committee and GE Area B/Theme 1 Committee (member: Fall 2009 – Spring 2015, chair of committee: Fall 2013 – Spring 2015).
- Faculty Juror or Moderator for CSUB Student Research Competitions (multiple years).
- Search committees: Dean of NSME (2016/17), Associate Dean of NSME (2014/15), AVP of IT Services (2014/15), NSME Fab Lab Coordinator (2014/15), Director of Infrastructure and User Support for ITS (2013/14), and department searches.

Selected Publications and Presentations

- M. Danforth, C. Lam. "Effects of a Four-Week Cyber Security Summer Program on the Attitudes and College Interests of High School Students". Colloquium for Information Systems Security Education (CISSE) Journal, Edition 4, Issue 2, February 2017.
- M. Danforth, C. Lam, H. Mehrpouyan, R. Hughes. "Impact of a Hands-On, Exploratory Engineering Outreach Program on Knowledge and Attitudes of High School Students". Annual Conference for ASEE. New Orleans, LA, USA, June 2016.
- C. Lam, M. Danforth, R. Hughes. "Short-term Exploratory Summer Program for At-Risk First Year Students". Poster session at Annual Conference for ASEE. June 2016.
- M. Danforth, C. Lam. "Implementation of Multidisciplinary Cyber Security Curriculum at a Medium Sized Campus". Extended abstract and roundtable presentation at the CISSE annual colloquium. June 2016.
- M. Danforth, C. Lam. "Four Week Summer Program in Cyber Security for High School Students: Practice and Experience Report". Extended abstract and panel discussion at the Workshop on Cyber Security Experimentation and Test (CSET'14). August 2014.
- C. Lam, M. Danforth, R. Hughes. "A Comprehensive Approach on Delivering Calculus to Engineering Students". Annual Conference for ASEE. June 2014.
- M. Danforth and S. Garcia. "Experiences Teaching System Administration via Online Modules." Poster session at Summit for Educators in System Administration. Nov. 2013.
- M. Danforth. "WCIS: A Prototype for Detecting Zero-Day Attacks in Web Server Requests." Proceedings of the USENIX Large Installation System Administration Conference (LISA 2011). December 2011.

Professional Development Activities

- NSF SFS grant Dissemination Workshops at CSUB. July 2015 and July 2014. Led workshops on cyber security education/outreach for K-12 teachers and university faculty.
- Faculty Fellows Program at CSUB. 2015/16 AY. Participated in leadership workshop series for all levels of faculty interested in furthering their leadership skills.
- Mid-Career Fellows Program at CSUB. Winter 2013. Participated in leadership development via pairing associate professors with mentors in academic administration.
- Ethics Across the Curriculum at CSUB. Fall 2013 – Present.

Saeed Jafarzadeh

Education

Ph.D. 2009-2012	Electrical Engineering	University of Nevada, Reno
M.S. 2005-2008	Electrical Engineering	Iran University of Science & Technology
B.S. 2000-2005	Electrical Engineering	University of Tehran

Academic Experience

- California State University, Bakersfield, Aug. 2012 - present, Computer & Electrical Engineering & Computer Science Department, *Assistant Professor/Director of Power Systems Laboratory*. Full time.

Non-Academic Experience

- None

Certifications or Professional Registrations

- None

Memberships in Professional Organizations

- Institute of Electrical & Electronics Engineers (IEEE)
- IEEE Industrial Electronics Society

Honors and Awards

- "Quantitative Forecasting for Grid-Connected Renewable Power Generation: Fuzzy Logic Approach," funded by Department of Defense, $440,342, (2015-18). **PI**
- "Acquisition of a Multi-Domain Advanced Real-Time Simulator to Support DoD-focused Interdisciplinary Research at CSUB," funded by Department of Defense, $480,210. **PI**
- "Research, Experiential and Learning Opportunities for underrepresented students in biological and agricultural engineering," submitted to USDA, $274,728. **co-PI**
- "Increasing the Productivity of the Engineering Degree Pipeline in the High Needs Southern San Joaquin Valley: A Sound Cooperative Arrangement Project with Bakersfield College.," funded by Dept. of Ed., $3,249,688, 2015-2020. **Project Coordinator.**
- "STEM Retention & Graduation: An Integrated Approach," funded by NSF DUE: IUSE, $1,083,336, 2014-2016. **Senior Personnel**

Selected Service Activities

- Director of Power Systems Laboratory at CSUB
- Associate Editor of the following journals:
  - IEEE Transactions on Fuzzy Systems
  - Asian Journal of Control
- Reviewer for the following publications:
  - IEEE Transactions on Power Electronics
  - IEEE Transactions on Industrial Electronics
  - IEEE Transaction on Neural Networks and Learning Systems
  - IEEE Control Systems Magazine
  - Journal of Circuits, Systems & Signal Processing
  - Advances in Engineering Education
  - Artificial Intelligence for Engineering Design, Analysis and Manufacturing

Selected Publications and Presentations

- **S. Jafarzadeh**, M. S. Fadali, Hanif Livani, "TSK Modeling and Stability Analysis of Energy Markets," IEEE Trans. on Power Systems, Vol. 31, Issue 2, pp. 1161-1169, 2016.
- H. Livani, **S. Jafarzadeh**, C. Y. Evrenosoglu, and S. Fadali, "A Unified Approach for Power System Predictive Operations using Viterbi Algorithm," IEEE Trans. on Sustainable Energy, Vol. 5, Issue 3, pp. 757-766, 2014.
- M. S. Fadali, **S. Jafarzadeh**, "Stability Analysis of Positive Interval Type-2 TSK Systems with Application to Energy Markets," IEEE Trans. on Fuzzy Systems, Vol. 22, Issue 4, pp. 1031-1038, 2014.
- M. S. Fadali, **S. Jafarzadeh**, "TSK Observers for Discrete Type-1 and Type-2 Fuzzy Systems," IEEE Trans. on Fuzzy Systems, Vol. 22, Issue 2, pp. 451-458, 2014.
- **S. Jafarzadeh**, M. S. Fadali, "On the Stability and Control of Continuous TSK Fuzzy Systems," IEEE Trans. on Cybernetics, Vol. 43, Issue 3, pp. 1073-1087, June 2013.
- **S. Jafarzadeh**, M. S. Fadali, C. Y. Evrenosoglu, "Solar Power Prediction Using Interval Type-2 TSK Modeling," IEEE Trans. on Sustainable Energy, Vol. 4, Issue 2, pp. 333-339, April 2013.
- **S. Jafarzadeh**, C. Lascu, M. S. Fadali, "Square Root Unscented Kalman Filters for State Estimation of Induction Motor Drives," IEEE Trans. on Industry Applications, Vol. 49, Issue 1, pp. 92-99, January 2013.
- **S. Jafarzadeh**, C. Lascu, M. S. Fadali, "State Estimation of Induction Motor Drives Using the Unscented Kalman Filter," IEEE Trans. on Industrial Electronics, Vol. 59, Issue 11, pp. 4207-4216, Nov. 2012.

Professional Development Activities

- None

Chengwei Lei

Education

Ph.D. 2014	Computer Science	University of Texas, San Antonio
M.S. 2008	Computer Science	University of Texas, San Antonio
B.S. 2005	Computer Science and Engineering	Beijing University of Aeronautics and Astronautics

Academic Experience

- California State University, Bakersfield. Assistant Professor (Aug. 2016 – present). Full-time.
- McNeese State University, Assistant Professor, 2014-2016, full time
- UT at San Antonio. Research Scientist (Aug. 2010 – July. 2014). Part-time.
- UT at San Antonio. Research Assistant (Aug. 2008 – July. 2009). Part-time.

Non-Academic Experience

- None

Certifications or Professional Registrations

- None

Memberships in Professional Organizations

- None

Honors and Awards

- Principal Investigator: "Topology-based Approaches to Integrated Analysis of Cancer Prognosis" from CSUB RCU Mini-grant, Granted $2,660, 12/2016-8/2017
- Student Research Advisor (Mabelle Cruz & Andy Koumane): "Observation of Pollution in Skies above Seawater and Costal Areas using Dynamic Self-Guided UAV" from CSU COAST Undergraduate Student Research Program, Granted $833, 12/2016-8/2017
- Principal Investigator: "Improve the Breast Cancer Prediction Accuracy by Enhancing Biological Network" from McNeese Foundation Endowed Professorships, Granted $5,000, 12/2014-12/2015
- Advisor of the Best Student Project Award in McNeese State University USRS (2016)
- Presidential Dissertation Fellowship, UTSA (2014)
- Graduate Student Research Award, UTSA (2013)

Selected Service Activities

- Reviewer for PLOS ONE, Bioinformatics, IEEE Transactions on Signal Processing, BioMedical Engineering Online
- Graduate Program Coordinator, McNeese State University
- Scholarship Committee and APR Committee, McNeese State University

Selected Publications and Presentations

- C. Lei, W. Tian, Y. Zhang, R. Fu, R. Jia and R. Winter, Probability-Based Circuit Breaker Modeling for Power System Fault Analysis, IEEE Applied Power Electronics Conference and Exposition, Tampa, FL, USA, March 26-30, 2017
- C. Lei and R. Jia, State Estimation in Computer Virus Epidemic Dynamical Systems using Hybrid Extended Kalman Filter, IEEE International Conference on Systems, Man, and Cybernetics, Budapest, Hungary, October 9-12, 2016

- W. Tian, C. Lei (Co-corresponding author), Y. Zhang, D. Li and R. Winter, Data Analysis and Optimal Specification of Fuse Model for Fault Study in Power Systems, IEEE Power & Energy Society General Meeting, Boston, MA, USA, July 17-21, 2016
- J. Ruan, MJ Jahid, F. Gu, C. Lei, etc., A novel algorithm for network-based prediction of cancer recurrence, Genomics, 2016
- H. Asere, C. Lei, R. Jia. Cruise Control Design Using Fuzzy Logic Controller, IEEE International Conference on Systems, Man and Cybernetics, Hong Kong, China, October 09-12, 2015
- C. Lei and J. Ruan, Fully automated protein complex prediction based on topological similarity and community structure, Proteome Science, 11(Suppl 1):S9, 2013.
- C. Lei and J. Ruan, A novel link prediction algorithm for reconstructing protein-protein interaction networks by topological similarity, Bioinformatics, 29(3): 355-364, 2013
- J. Ruan, MJ Jahid, F. Gu, C. Lei, etc., Network-based classification of recurrent endometrial cancers using DNA methylation data, ACM Conference of Bioinformatics, Computational Biology and Biomedicine, 2012
- C. Lei and J. Ruan, A random walk based approach for improving protein-protein interaction network and protein complex prediction, IEEE International Conference on Bioinformatics and Biomedicine, 2012

Professional Development Activities

- Introduction to writing research grants workshop, 12/2016

Wei Li

Education

Ph.D. July 1991	Robotics/Computer Eng.	University of Saarland, Germany
M.S. December 1984	Electrical Engineering	Beijing Jiaotong University, China
B.S. February 1982	Mechanical Engineering	Beijing Jiaotong University, China

Academic Experience

- California State University, Bakersfield. Full Professor (July 2005 – present), Associate Professor (October. 2001 – July 2005). Full time.
- University of California, Riverside. Research Scientist (July 1999 – July 2001).
- Technical University of Braunschweig, Germany. Alexander von Humboldt Research Fellow (July 1997 – March 1999).
- Tsinghua University, China. Full Professor, (July 1996 – Oct. 2001), Associate Professor (December 1993 – July 1996), Postdoctoral Research Fellow (Oct. 1992 – Dec. 1993).
- University of Saarland, Germany. Research Associate, (July 1991 – Oct. 1992).
- Beijing Jiaotong University, China. Lecturer (Dec. 1984 – April 1988)

Non-Academic Experience

- University of Saarland, Germany. Researcher Assistant (March 1988 – July 1991), and part-time while working on doctor dissertation.

Certifications or Professional Registrations

- None

Memberships in Professional Organizations

- Member of The American Society of Mechanical Engineers (ASME)
- Member of The Institute of Electrical and Electronics Engineers (IEEE)

Honors and Awards

- The 1995 National Award for Outstanding Postdoctoral Researchers in China
- The 1995 Chinese Education Award Foundation for Outstanding Young Teachers
- The 1996 Award for Outstanding Young Professors at Tsinghua University.
- The 1997 Alexander von Humboldt Foundation Research Fellow in Germany

Selected Service Activities

- Referee for ASME Journal of Dynamic System, Measurement and Control
- Referee for IEEE Transactions on Industrial Electronics
- Referee for IEEE Transactions on Neural Networks
- Referee for IEEE Transactions on Fuzzy Systems
- Referee for IEEE Transactions on Systems, Man, and Cybernetics
- Referee for IEEE Transactions on Robotics
- Referee for IEE Proceedings C, Control Theory and Applications
- Referee for International Journal of Engineering Application of Artificial Intelligence
- Referee for Mechatronics
- Referee for Fuzzy Sets and Systems
- Referee for Pattern Recognition Letters
- Referee for International Journal of System Science
- Referee for Automatica, an IFAC Journal

Selected Publications and Presentations

- X. Q. Mao, M. F Li, W. Li*, L. W. Niu, B. Xian, M. Zeng, G. S. Chen. “Progress in EEG-Based Brain Robot Interaction Systems”. Computational Intelligence and Neuroscience. Vol. 2017, Article ID 1742862, 25 pages.
- X. Q. Mao, X. Wen, Y. Song, W. Li*, G.S. Chen. “Eliminating drift of the head gesture reference to enhance Google Glass-based control of an NAO humanoid robot”. International Journal of Advanced Robotic Systems. March-April 2017: 1–10.
- L. W. Niu, W. Li. “Reliability-conscious energy management for fixed-priority real-time embedded systems with weakly hard QoS-constraint”. Microprocessors and Microsystems. October 2016, Vol.46, 107 – 121.
- Q. Chen, W. Li*, G. S. Chen. “A FUZZY P+ID Controller for a Constant Tension Winch in a Cable Laying System”. IEEE Transactions on Industrial Electronics, Nov. 2016.
- J. Zhang, W. Li*, J. C. Yu, X. Q. Mao, M.F. Li, G. S. Chen. “Operating an underwater manipulator via P300 brainwaves”. 23rd International Conference on Mechatronics and Machine Vision in Practice (M2VIP), Nov. 2016.
- Z. Y. Qiu, B. Z. Allison, J. Jing, Y. Zhang, X. Y. Wang, W. Li, A. Cichocki. “Optimized motor imagery paradigm based on imagining Chinese characters writing movement”. IEEE Transactions on Neural Systems and Rehabilitation Engineering, September 2016.
- W. X. Li, M. F. Li, W. Li* “Improving Accuracy of Event-Related Potentials Classification by Channel Selection Using Independent Component Analysis and Least Square Methods”. International Journal of Software Science and Computational Intelligence, 8(3), 2016.
- X.Q. Mao, H. D. He, W. Li* “Path finding for a NAO humanoid robot by fusing visual and proximity sensors”. 12th World Congress on Intelligent Control and Automation (WCICA), pp. 2574-2579, 2016
- X. Wen,Y. Song, W. Li*, G. S. Chen, B. Xian “Rotation Vector Sensor-based Remote Control of a Humanoid Robot through a Google Glass”. 2016 IEEE 14th International Workshop on Advanced Motion Control (AMC), 2016.

Professional Development Activities

- None

VidaVakilian

Education

Ph.D. June 2014	Electrical Engineering	University of Montreal
M.S. March 2008	Electrical Engineering	University Technology Malaysia
B.S. June 2004	Electrical Engineering	Azad University

Academic Experience

- Sept. 2015-Present: Assistant Professor, Dept. of Comp. and Elec. Eng. & Comp. Science, California State University, Bakersfield, USA. Full time.
  Teaching courses in electrical engineering, e.g., Digital Communications, Fields and Waves, Digital Design with VHDL, Signal and Systems. Running a summer program in partnership with Chevron with the goal of encouraging the participation of women and minorities in the field of engineering. Faculty Advisor of the IEEE CSUB Student Branch. Supervising number of undergraduate research projects. Assisting with obtaining ABET accreditation for the engineering programs.
- April 2014-Aug. 2015: Postdoctoral scholar, Department of Electrical and Computer Engineering, University of California, Riverside, USA.
  Conducting research on signal processing architecture for next generation wireless communication systems, particularly millimeter-wave communication systems.
- April 2014-Aug. 2015: Lecturer, Department of Computer and Electrical Engineering and Computer Science, California State University, Bakersfield, USA. Teaching courses in electrical engineering, e.g., Digital Design with VHDL, Complex Analysis in Eng., Signal and Systems. Preparing course assessment reports and portfolios for ABET accreditation.
- May 2009-June 2014: Research Assistant, Department of Electrical Engineering, University of Montréal, Canada.
  Developing a new direction-of-arrival estimation algorithm for a single element antenna with capability of changing its radiation pattern characteristics. Evaluation of the developed algorithm in an anechoic chamber. Proposing a novel block coding scheme for MIMO-OFDM systems equipped with reconfigurable antennas.

Non-Academic Experience

- Feb. 2013-Feb. 2014: System Engineer, *InterDigital Communications Lte*, Montréal, Canada.
  Algorithm design and modeling for emerging wireless communication systems. This includes developing signal processing algorithms for 3GPP standards-based cellular systems, link/system level simulation, implementing advanced receiver algorithms for LTE/LTE-A.
- Aug.2012-Dec. 2012: Intern, Alcatel-Lucent Bell Labs, Stuttgart, Germany.
  Carrier frequency offset modeling and compensation for a Coordinated Multi-Point system in the LTE-Advanced standard. Proposed multi-carrier transmission scheme in order to overcome the intercarrier interference problem in OFDM systems.

Certifications or Professional Registration

- None

Memberships in Professional Organizations

- None

Honors and Awards

- Aug. 2014: NSF Wireless Innovation between Finland and US (WIFIUS) Grant,

Reconfigurable Antennas for Millimeter-wave and Microwave Systems.

- May 2016: NSF Enhancing Access to the Radio Spectrum (EARS) Grant, Collaborative Research: Overcoming Propagation Challenges at Millimeter-Wave Frequencies via Reconfigurable Antennas, Awarded, September 2016.
- Aug. 2016: NSF CISE Research Initiation Initiative (CRII) Grant, Efficient Data Detection Scheme for Next Generation of Wireless Communication Systems, under review.
- Aug. 2016: Department of Defense HBCU/MI Grant, Towards High Rate Millimeter-Wave Wireless Communication Systems.
- Sept. 2015: DoD Defense University Research Instrumentation Program (DU- RIP) Grant, Acquisition of a Multi-Domain Advanced Real-Time Simulator to Support DoD-focused Interdisciplinary STEM Research at CSUB.
- Oct. 2015: NSF Improving Undergraduate STEM Education (IUSE) Grant, A Comprehensive Engineering Emphasis for Enhancing Student Participation and Training in Electrical Power Systems.
- Sept. 2015: NSF CISE Research Initiation Initiative (CRII) Grant, Novel Coding Transmission Schemes for Next Generation of Communication Systems.

Selected Service Activities

- None

Selected Publications and Presentations

- Vida Vakilian, Hani Mehrpouyan, Yingbo Hua, Hamid Jafarkhani, "High-Rate Space Coding for Reconfigurable 2×2 Millimeter-Wave MIMO Systems," in preparation for submission to IEEE Communication Letters, Sept. 2016.
- Jenny Villatoro, Vida Vakilian, "Wireless Spectrum-Capnography System for Detecting Cholesterol Levels in the Blood," in Proc. International Conference on Biomedical Engineering and Sciences, Jul. 2016.
- Reza Abdolee, Vida Vakilian, "Optimal Combination Weights for Diffusion LMS over Multi-Agent Networks," submitted to IEEE Journal of Internet of Things, May 2016.
- Reza Abdolee, Vida Vakilian, Benoit Champagne, "Tracking Performance and Optimal Adaptation Step-Sizes of Diffusion LMS Networks," to appear in IEEE Transactions on Control of Network Systems, 2016.
- Vida Vakilian, Jean-Francois Frigon, Sebastien Roy, "On Increasing the Slow Fading Channel Diversity Using Block Coded MIMO-OFDM with Reconfigurable Antennas," in IEEE Transactions on Veh. Tech., Oct. 2015.

Professional Development Activities

- None

Huaqing Wang

Education

Ph.D. May 1988	Computer Science	Case Western Reserve University
B.S. August 1977	Computer Science	Huazhong University Of Science & Technology, P.R. China

Academic Experience

- California State University, Bakersfield: Associate Professor Sept. 1988 – August 1994
- California State University, Bakersfield: Full Professor Sept. 1995 – August 2016
- California State University, Bakersfield: Associate Professor Sept. 2016 – Now, part-time on Faculty Early Retirement Program.
- Case Western Reserve University Teaching & Research: Assistant, Sept. 1984 – May 1988
- Huazhong University Of Science & Technology: Instructor and Researcher Assistant.
- Visiting Professor of Mechanics and Automation College of Shanghai Institute of Technology, teaching computer science course during the summer break between June and July of year 2005, 2006 and 2007.
- Visiting Professor of School of Software Engineering, Huazhong University of Science & Technology (HUST), China, summer or winter break 2008 – now.
- **Chair of Computer Science (renamed to CEE/CS department), 2003 – 2005.**

Non-Academic Experience

- 1993 – Now. Independent software consultant, developer and trainer.
- Chemical storage tracking system. 2015.
- Grape Harvest data collection system for Dole Fresh Fruit Company. 2009.
- Preliminary investigation and preparation of designing and implementation of a *Web-Based Application Software* for accessing patients' medical data for *The Centennial Group* since March 2009.
- Designed and implemented the *Metrics Tracking System* for *Nabors Well Services Co*. The system stores and generate reports on jobs performed by rigs on wells. November 2008 – January 2009.
- Re-design of database schema for *Catholic-online, Bakersfield, California,* June 2003
- Design, Supervision and Implementation www.unions.org website – one year project, June 2000 – May 2001.
- Design and implement part of the Office Data Collection system for Dedicated Dental Systems.
- Design and implemented Timesheet program for Occidental Petroleum Cooperation to collect data and to generate report for engineering projects.
- Conceptual Database Design of the enterprise database for Aera Energy Co., a local petroleum company
- Design and implement part of Reservoir Management System for *Mobil*, a nation-wide petroleum company.
- Design and implement a part of Property Management System for Jaco Oil Co.
- Grape harvesting payroll data collection system for Dole Fresh Fruit Company, a world-wide fruit company.
- Data Management System for Cannon Energy, a wind power generation company.

Certifications or Professional Registrations

- None

Memberships in Professional Organizations

- None

Honors and Awards

- California State University, Bakersfield: Millie Ablin Excellence in Teaching Award 2013-2014
- California State University, Bakersfield: Service Award of School of NSME 2013-2014
- California State University, Bakersfield: The Award of Emeritus Status, May 17, 2016

Selected Service Activities

- University Program Review Committee.
- Departmental Faculty Review committee member 1995 – now.

Selected Publications and Presentations

- Grid File for Efficient Data Cube Storage, Computers and Their Applications 2006: 41-46
- Validation of the Potentials of Vertical Striping on Disks, Computers and Their Applications 2006: 57-63
- A Framework for Clustering on Data Streams, Computers and Their Applications 2006: 41-46

- Example-Based Graphical Database Query Languages, IEEE Computer, May 1993, Vol 26, No. 5, pp. 25 -- 38.
- Object-Oriented Programming in Turbo Pascal", Computers in Education Journal (CoED), ASEE, Vol II, No. 3, July-September, 1992, pp64-68.
- A Relational Calculus with Set Operators, Its Safety, and Equivalent Graphical Languages, IEEE Transaction on Software Engineering, Sept 1989, Vol 15, No. 9. Cited in book "Principle of Database and Knowledge-Based Systems" by Jeffrey D. Ullman.

Professional Development Activities

- Training employees of local companies, WEBASIS, Advantage, Pinnacle, and Kern Health Center.

José Antonio Cardenas-Haro

Education

Ph.D. December 2010	Computer Science	Arizona State University
M.S. December 2001	Computer Science	CICESE (Research Center)
B.S. December 1995	Electrical Engineering	ITLM (Technological Inst.)

Academic Experience

- CSUB, Lecturer, Aug. 2016 - Present (One year), Full time.
- UMSL, Assistant Teaching Professor, Two years, Full time.
- UABC (Mexico), Professor, Three years and a half, Full time.

Non-Academic Experience

- Otis Elevator Co (UTC), Electronics Engineer, 1.5 years, Full time.
- Samsung Display Devices, Electronics Engineer, 2 years, Full time.

Certifications or Professional Registrations

- None

Memberships in Professional Organizations

- Member of the IEEE-HKN

Honors and Awards

- Member of the IEEE-HKN (IEEE - Eta Kappa Nu) honor society.
- Fulbright-Laspau fellowship to pursue the PhD.
- Conacyt Scholarship to pursue the Master's

Selected Service Activities

- As a member of HKN (Eta Kappa Nu) I was enrolled in several volunteer activities including tutoring math and programming at ASU.
- Technical Judge at the Hackathon (Nov 2016).
- Reviewer of Scientific Manuscripts for publication.

Selected Publications and Presentations

- Tails Linux Operating System: Remaining Anonymous with the Assistance of an Incognito System in Times of High Surveillance. Dawson, M., & Cárdenas-Haro, J. A. (2017). International Journal of Hyper-connectivity and the Internet of Things (IJHIoT), 1(1), 47-55. doi:10.4018/IJHIoT.2017010104
- Evaluation of Materials in a Biomechanical System for Uses in Industrial Lifting Activities. Roberto L. Avitia, Gustavo López-Badilla, Ruben Castaneda-Martinez, Marco A. Reyna, Jose A. Cardenas-Haro, Miguel E. Bravo-Zanoguera. Advanced Building Materials for Passive House and Energy Storage. Journal: Advances in Materials Science and Engineering. March 2017.
- Tails Linux, the amnesiac incognito system in times of high surveillance, its security flaws, limitations and strengths in the fight for democracy. José Antonio Cárdenas-Haro, Maurice E. Dawson Jr.; Security Solutions for Hyper-connectivity and the Internet of Things. IGI Global; pages 260-271. ISBN13: 9781522507413. August, 2016.
- A Complete Study of Variability in Time and Amplitude of a Standard ECG Database. Manuel M. Casas, Roberto L. Avitia, Alexandra Gomez, Marco A. Reyna, Jose A. Cardenas-Haro. International Journal of Computer Theory and Engineering. IJCTE 2015 Vol.7(5): 366-373 ISSN: 1793-8201.
- Análisis de la Aceleración del Algoritmo Mergesort en Paralelo. José Antonio Cárdenas-Haro, Roberto López-Avitia, Marco A. Turrubiartes Reynaga. XXIV Semana de Investigación y Docencia en Matemáticas. Universidad de Sonora, Marzo 2014.
- Comparación de Secuencias de Código Genético utilizando Matrices de Substitución. Cárdenas-Haro J.A., Vargas-Figueroa A.J., Maupome-Polanco A.F., XXIII Semana de Investigación y Docencia en Matemáticas. Universidad de Sonora, Marzo 2013.

- Sage, Software Libre para la Investigación y la Enseñanza de las Matemáticas. José Antonio Cárdenas-Haro, Gabriel M. Ramírez-Arizaga, Luis R. Ramírez-Avelar. XXII Semana de Investigación y Docencia en Matemáticas. Universidad de Sonora, Marzo 2012.

Professional Development Activities

- From the beginning, I have been participating in different activities and courses provided by CSUB for professional development, including:
  - Applying Quality Matters Rubric Training program
  - CSU Data Security and Privacy course
  - Classroom Management Techniques course
  - An Introduction to Writing Research Grants workshop
- Ethics Across the Curriculum
- Collaborative research in cybersecurity and other topics

Gordon Griesel

Education

MBA, 2006	Business Administration	California State University, Bakersfield
B.S. 2013	Computer Science	California State University, Bakersfield
B.S. 1981	Business Management	California State College, Bakersfield

Academic Experience

- Lecturer, California State University Bakersfield, Bakersfield, CA
  - CMPS-4350 Advanced Software Engineering, 2016 to present, developed syllabus and course structure, and administered all grades.
  - CMPS-3480 Computer Graphics, 2016 to present, developed syllabus and course structure, and administered all grades.
  - CMPS-2240 Assembly Language Programming, 2016 to present, developed syllabus and course, including lectures and labs, and administering all grades.
  - CMPS-222 Object Oriented Programming, 2016, developed syllabus and course, including lectures and labs, and administering all grades. Twice during 2016.
  - CMPS-312 Algorithm Analysis and Design, 2014 – 2015, developed syllabus and course structure, including weekly labs, and administered all grades.
  - CMPS-335 Software Engineering, 2013 – 2016, developed syllabus and course structure, and administered all grades.
  - CMPS-371 Computer Graphics, 2013 – 2015, developed syllabus and course structure, and administered all grades.
  - CMPS-295 Discrete Structures, 2015, developed syllabus and course structure, and administered all grades.
  - CMPS-221 Programming Fundamentals, 2014 – 2015, developed syllabus and course, including lectures and labs, and administered all grades.
  - CMPS-223 Data Structures and Algorithms, 2014 – 2015, developed syllabus and course, including lectures and labs, and administered all grades.

Non-Academic Experience

- Consultant, Aera Energy, Bakersfield, CA, 2002 - 2003
  Built and tested a program to synchronize GIS location data for California oil wells; Coded a C++ interface to a GIS database in Oracle; Designed high quality graphics for use in software; Assisted in writing interface functions to the Oracle database
- Consultant, Naval Base Ventura County, CA, 1996 - 2002
  Lead developer on an Oracle applications; Oracle design, coding, data configuration, installation, training, and support; Developed remote implementation procedures for Marine bases; Directed team members in implementation and support; Conducted user workshops and technical training to groups of Marine personnel; Worked with a team to implement enterprise software at several Navy Bases
- Self-employed software developer – computer games.

Certifications or Professional Registration

- None

Memberships in Professional Organizations

- None

Honors and Awards

- Graduated Summa Cum Laude for B.S. in Computer Science, 2013

Selected Service Activities

- None

Selected Publications and Presentations

- None

Professional Development Activities

- Developed tools to produce photo-realistic stills and animations
- Implemented several web sites for a large flooring company
- Added real-time features to an Electronic Arts game engine
- Designed and programmed realistic flight simulators
- Successfully developed and published several video games

Derrick McKee

Education

B.S. 2008-2012	Computer Science	California State University, Bakersfield

Academic Experience

- Full-time lecturer, California State University, Bakersfield. 2012 – Present
  Classes taught: Programming Fundamentals, Object-Oriented Programming, Data Structures and Algorithms, Computer Architecture, Internet Program and Web Design, Server Scripting Languages, and Dynamic Web Design
  Additional Duties: front and back end web applications for department website

Non-Academic Experience

- Freelance work: developing e-commerce and advertising websites

Certifications or Professional Registration

- None

Memberships in Professional Organizations

- None

Honors and Awards

- None

Selected Service Activities

- None

Selected Publications

- None

Professional Development Activities

- None

Ehsan Reihani

Education

Ph.D. December 2016	Mechanical Engineering	University of Hawaii, Manoa
M.S. September 2008	Electrical Engineering	University of Shahrood
B.S. February 2005	Electrical Engineering	University of Sadjad

Academic Experience

- California State University, Bakersfield. Lecturer (Aug. 2016 – present). Full-time.
- Hawaii Natural Energy Institute, Postdoctoral Fellow (Jan. 2016-Aug. 2016).
- University of Hawaii, Manoa. Research Assistant (Sep. 2013 – Dec. 2015).

Non-Academic Experience

- Pouyagam Co., Embedded System Engineer (Jun. 2005 – Jun. 2006).

Certifications or Professional Registrations

- None

Memberships in Professional Organizations

- IEEE

Honors and Awards

- None

Selected Service Activities

- None

Selected Publications and Presentations

- A Novel Approach Using Flexible Scheduling and Aggregation to Optimize Demand Response in the Developing Interactive Grid Market Architecture, Applied Energy, 2016.
- Scheduling of Price-Sensitive Residential Storage Devices and Loads with Thermal Inertia in Distribution Grid, Applied Energy, 2016.
- Energy Management at the Distribution Grid Using a Battery Energy Storage System (BESS), International Journal of Electrical Power and Energy Systems, 2016.
- Optimal Placement and Sizing of the Storage Supporting Transmission and Distribution Net-works, Renewable Energy, 2016.
- Providing Frequency Regulation Reserve Services Using Demand Response Scheduling, Energy Conversion and Management, 2016.
- A Nascent Market for Contingency Reserve Services Using Demand Response, Applied Energy, 2016.
- Load Commitment of Distribution Grid with High Penetration of PV Using Hybrid Series-Parallel Prediction Algorithm and Storages, Electric Power Systems Research, 2016.
- Load Peak Shaving and Power Smoothing of a Distribution Grid with High Renewable Energy Penetration, Renewable Energy, 2016.
- Reliability Based Maintenance Scheduling of Generating Units Using Hybrid Evolutionary Algorithm, International Journal of Electrical Power and Energy Systems, 2012.

Professional Development Activities

- None

Steven A. Garcia

Education

B.A. May 1978	Physics	University of Colorado, Boulder

Academic Experience

- California State University, Bakersfield, Lecturer & Staff, Operating Systems Analyst, 14 years, Part time faculty, full time staff

Non-Academic Experience

- Schlumberger Well Services, Field Engineer, Acquire petrophysical data for oil and gas wells, 12 years, full time
- Schlumberger GeoQuest, Petrophysicist, Analyze petrophysical well data, 8 years, full time
- Schlumberger Oilfield Services, System Engineer, Managed all information systems for Schlumberger Pacific Division, 1 year, full time
- WebBasis, Vice President Network Services, System administrator for data center, 2 years, full time

Certifications or Professional Registrations

- None

Memberships in Professional Organizations

- None

Honors and Awards

- None

Selected Service Activities

- Serve on campus ITC (Information Technology Committee)
- Serve on campus ATC (Academic Technology Committee)

Selected Publications and Presentations

- None

Professional Development Activities

- Attend Southern California Linux Conference

Weiguo Luo

Education

Ph.D. 2005	Civil Engineering	Southeast University, China
M.S. 2012	Petroleum Engineering	University of Regina, Canada
B.S. 2002	Petroleum Engineering	Xian Petroleum Institute, China

Academic Experience

- California State University, Bakersfield, lecturer, 03/2016-present, Part time
  Teach the courses ECE 307 Analog Circuit, and ECE 1618 Introduction to Engineering I, instruct students to do lab projects in ECE 1628 Introduction to Engineering II.
- Yangzhou University, China, Associate Professor, Vice Chair of Department of Civil Engineering, 2005-2009, Full time
  Gave lectures to undergraduates, taught engineering lab course and developed the research projects.

Non-Academic Experience

- Saskatchewan Research Council (SRC), Regina, Canada, Research Engineer, 2012-2014, Full time. Designed and supervised PVT & analytical tests, conducted petroleum and chemical engineering experiments.

Certifications or Professional Registrations

- P.Eng., registered Professional Engineer of Canada

Memberships in Professional Organizations

- SPE member, the Society of Petroleum Engineers

Honors and Awards

- SPE 2012 University Award for Excellent Academic Performance

Selected Service Activities

- None

Selected Publications and Presentations

- Luo, W. and Torabi, F. 2013. Coupling of Solvent and Hot Water to Improve Heavy Oil Recovery: Experimental and Simulation Studies. Paper SPE 165444 presented at SPE Heavy Oil Conference-Canada in Calgary, Alberta, June 11–13.
- Luo, W. Xu, S. and Torabi, F. 2013. Study on the Chemical Degradation and Biochemical Removal of HPAM in Produced Water. Paper SPE 163751 presented at Americas E&P Health, Safety, Security & Environmental Conference in Galveston, Texas, 18–20 March.
- Gu. Y, Hou, P. and Luo, W. 2013. Effects of Four Important Factors on the Measured Minimum Miscibility Pressure and First-Contact Miscibility Pressure. Journal of Chemical and Engineering Data, 58(5), pp 1361–1370.
- Luo, W., Xu, S. and Torabi, F. 2012. Laboratory Study of Sand Production in Unconsolidated Reservoir. Paper SPE 158619 presented at SPE Annual Technical Conference and Exhibition in San Antonio, Texas, 8–10 October.
- Xu, S., Luo, W., Zeng, F. and Gu, Y. 2011. Application of Deep Hydraulic Jet Perforating to Enhance Oil Production in Thin Reservoir with Bottom Water. Paper SPE 145978 presented at SPE Asia Pacific Oil and Gas Conference and Exhibition in Jakarta, Indonesia, 20–22 September.

Professional Development Activities

- None

Marcelo Jay Manibo

Education

B.S. 1997	Computer Science	California State University, Bakersfield

Academic Experience

- Lecturer, August 2013 – Present, California State University, Bakersfield. Part time

Non-Academic Experience

- Sharepoint Development, Global Knowledge, June 2012
- Lead Software Developer, Stantec, formerly Processes Unlimited International, Inc – Bakersfield, CA (January 2012 – Present).
- Independent Contractor/Software Developer, Advanced Technologies – Bakersfield, CA 1996-2012
- Photographer, Technical Advisor, Commercial Acting Instructor, McCright Agency – Bakersfield, CA June 2006 – 2014
- Independent sales and marketing agent, World Financial Group, Bakersfield, CA, May 1997 – December 2007

Certification or Professional Registration

- None

Memberships in Professional Organizations

- None

Honors and Awards

- None

Selected Service Activities

- None

Selected Publications and Presentations

- None

Professional Development Activities

- Marketing/Sales training sessions by Tom Hopkins, Blair Singer, Eric Lofholm, T. Harv Eker, Donald Trump, Robert Kiyosaki, and Anthony Robbins
- Leadership sessions by John Maxwell, Anthony Robbins, Jim Rohn, and Zig Ziglar

Walter Morales

Education

M.S. December 2015	Petroleum Engineering	University of Southern California
B.S. June 2012	Computer Science	California State University, Bakersfield
B.S. December 2011	Mathematics	California State University, Bakersfield

Academic Experience

- California State University Bakersfield, Bakersfield, CA, 01/2015 to Present
  Part Time Computer Science Lecturer. Duties: Teaching Data Mining and Discrete mathematics to CSUB junior and senior students
- California State University Bakersfield, CA, 07/2013 to Present
  Part Time Math Lecturer. Duties: teaching pre-calculus and Calculus at CSUB to entry level students

Non-Academic Experience

- Chevron North America Exploration and Production Company Bakersfield, CA, 06/2012 to Present, Data Manager Technical Assistant – Full Time
- San Joaquin Valley Business Unit, UWT Intern – Working giving support to Earth scientist and Engineers by supporting a 3D model of an oil field and making sure that all relevant data (Directional data, well header data, logs, RSTs, etc.) are correctly loaded in the correct databases in order to be used in the model and built several custom applications using ArcGIS, FME, Python Scripts, batch files to automatize several tasks that were before performed manually increasing efficiency and accuracy while performing this tasks. Therefore, time savings and fewer hours were attained.

Certifications or Professional Registrations

- Geographic Information Systems (GIS) Certifications
  · Intermediate GIS Concepts for Petroleum.
  · Working with Rasters, Queries and Tables
  · Geoprocessing and Model Builder
  · 3D Analyst
  · Python for GIS

Memberships in Professional Organizations

- Society of Petroleum Engineers (SPE) – 06/2016 to Present

Honors and Awards

- Obtained the maximum performance review (1) in all performance review process conducted within Chevron in 2013, 2014 and 2015.
- Dean's List, CSUB
- Louis Stokes Alliances for Minority Participation Scholarship recipient, $6,000 (2008 -2011)
- National Science Foundation Scholarship recipient, $15,000 (2008 -2011)
- Chair Award - Mathematics Department at CSUB (2011)
- CSUB Outstanding Computer Science Graduate Award (2012)

Selected Service Activities

- None

Selected Publications and Presentations

- None

Professional Development Activities

- None

Edward Rangel, Jr.

Education

M.S. May 2017	Software Engineering	California State University, Fullerton
B.S. June 2012	Computer Science	California State University, Bakersfield
A.S. May 2008	Computer Information Systems	Bakersfield College

Academic Experience

- Bakersfield College, Asst. Professor (Fall 2016 – Present). Full-time
- California State University, Bakersfield, Lecturer (Winter 2016 – Fall 2016). Part-time
- Bakersfield College, Adjunct Lecturer (Fall 2014 – Spring 2015). Part-time

Non-Academic Experience

- Theta Oilfield Services Software Engineer (November 2014 – July 2016) Developed and Maintained Automation and Optimization Applications used in the Oil & Gas Industry. Full-time.
- Kern Health Systems Programmer III (May 2013 – November 2014) Team Lead for a small group of off shore developers. Develop and Maintain Web Applications and Databases using C#, .Net, and T-SQL for Claims and other Business Unit clients. Full-time.
- State Farm End User Computing Analyst (August 2012 – May 2013) Develop Web Application using C# .NET Framework and Model-View-Controller applications using Linq and Entity Framework for Business Unit clients. Full-time.
- Kern Federal Credit Union Information Systems Supervisor (July 2011 – August 2012) Responsible for directing and organizing the operational activities of the Information Systems Department. Full-time.
- City of Delano Information System Coordinator (January 2007 – June 2011) Responsible for managing and organizing the Information Systems Division including developing and overseeing a Division budget of $500K. Full-time.

Certifications or Professional Registrations

- CompTIA A+
- CompTIA Network+
- CompTIA Security+
- Microsoft Certified Professional
- Microsoft Certified Desktop Support Technician

Memberships in Professional Organizations

- Association of Computer Machinery (ACM). ACM Special Interest Group Information Technology Education
- Information Systems Security Association (ISSA). Kern County Chapter

Honors and Awards

- None

Selected Service Activities

- Safety Advisory Committee for Bakersfield College (Fall 2017 – Present)

Selected Publications and Presentations

- None

Professional Development Activities

- Summer Pathways Institute (May 2016 and May 2017) Participated in a workshop series for developing guided pathways.

Michael Sarr

Education

B.S. December 2004	Computer Science	California State University, Bakersfield
B.S. December 2004	Anthropology	California State University, Bakersfield

Academic Experience

- Bakersfield College, Adjunct Instructor in Computer Studies, 4 years, Part time
- Cal State Bakersfield, Adjunct Instructor in Computer Science, 4 years, Part time

Non-Academic Experience

- City Of Bakersfield, Programmer / Analyst, 11 years, Full time
- Kern Health Systems, Programmer / Analyst, 1 year, Full time
- Threshold Networks, Sr Software Engineer, 4 years, Full time

Certifications or Professional Registrations

- None

Memberships in Professional Organizations

- None

Honors and Awards

- None

Selected Service Activities

- None

Selected Publications and Presentations

- None

Professional Development Activities

- None

E. Computer Science 2010/11 Program Review – Recommendations and Responses

a. University Program Review Committee (UPRC)

1) The UPRC encourages the program to put in place an assessment plan for teaching effectiveness and to seek consultation with the Assessment Center to begin to address this area.

   This recommendation, along with recommendation #5 and the narrative of the report, illustrate some misunderstandings about the nature of ABET assessment for engineering and computer science programs. It seems as if the UPRC viewed ABET assessment as simply course-level assessment. This is far from the truth. ABET accreditation looks at the program as a whole, not at individual courses. Also, ABET literature emphasizes the importance of teaching effectiveness, and expects that the program will look at the overall assessment results for the program, not just individual course results, to engage in a continuous cycle of improvement aimed at improving teaching effectiveness.

   There are three important components to program-level assessment under ABET: the program educational objectives (Criterion 2), student learning outcomes (Criterion 3), and continuous improvement of the program (Criterion 4). Program educational objectives (PEOs) are the program's vision of what graduates will achieve several years after graduation. Student learning outcomes (SLOs) on the other hand reflect knowledge and skills obtained by the time of graduation. One can view the SLOs as the foundation which enables graduates to achieve the PEOs.

   While course-level assessment is a vital component of program-level assessment, course-level assessment primarily provides data in relation to Criterion 3 outcomes. Programs are also expected to look at other metrics in relation to Criteria 2-4, such as nationally-normed exams, student scholarship activity, student placement, feedback from industrial partners, feedback from students and alumni, and so on. This information is used by the program to engage in continuous improvement.

   In addition to the expectation of continuous improvement through program-level assessment, ABET accreditation looks at the nature of the student population (Criterion 1), the quality of the curriculum (Criterion 5), the quality of the program faculty (Criterion 6), and the program facilities and resources (Criteria 7 and 8). The department has engaged the services of an ABET consulting firm, Accreditation Preparation, to review all criteria for the ECE programs, not simply the Criterion 3 course-level assessment plan.

2) The UPRC strongly recommends that the Computer Science Program comply with the 180 units maximum for its degree. The UPRC recommends that the Computer Science faculty take a serious look at a possible link between the rigor of the Computer Science Program and its attrition rate.

   Not applicable to Computer Engineering and Electrical Engineering.

3) The UPRC recommends that the Computer Science faculty construct a plan for the elimination of the Hardware track. This plan should include helpful student roadmaps and tracking enrollments of certain courses.

   The Hardware track requirements were a subset of the 2011-13 Computer Engineering requirements. Students were provided a flyer that compared the two programs and detailed the courses Hardware track students would need to take to transition over to the Computer Engineering program. Students were also advised of these differences during their advising appointments with department faculty.

4) The UPRC recommends against CAC/ABET accreditation for the Computer Science degree. There are no data in the self-study that shows the cost or benefit of accreditation. The UPRC believes from the external reviewer that accreditation for Computer Engineering is necessary, and if so, ought to take priority.

   The department plans to pursue ABET accreditation for just Computer Engineering and Electrical Engineering during the first accreditation cycle. We will revisit the issue of seeking ABET accreditation for Computer Science during the second accreditation cycle.

5) The UPRC recommends that Computer Science develop a proposal that outlines the future two track program (Computer Science and CIS), together with the Computer Engineering Program (formerly the Hardware track) with regards to which courses need ABET accreditation and which do not, which courses are shared courses and which are not, and the faculty resources that ABET accreditation would demand. This proposal should outline any new courses for the programs, and which faculty in the Computer Science Department will receive reduced workloads and which will not.

See the response to recommendation #1 above.

6) The UPRC recommends that the Computer Engineering program be scheduled for self-study in four years. There is a major concern about the financial demands of the department after the external funding for Engineering terminates.

   As is standard for accredited programs, Computer Engineering is being reviewed in the year of its accreditation visit.

7) The UPRC recommends that faculty from Computer Science lend their expertise toward campus data enhancements as a form of service to the institution.

   This is not applicable to Computer Engineering and Electrical Engineering.

b. External Evaluator

The following are the recommendations made by Dr. Georgiou for the 2010-11 Computer Science program review. The recommendations are broken down into several areas related to ABET program assessment, student support, the faculty, the curriculum, the facilities and laboratories, and institutional support. The department response is indicated for each recommendation that is relevant to the Computer Engineering and Electrical Engineering programs.

In the words of Dr. George M. Georgiou: "The recommendations should be considered as applicable to all programs: the B.S in Computer Science both the hardware track (to be transformed into the B.S. in Computer Engineering), the Computer Science track, and the CIS software track."

<u>Program Assessment</u>

1. Assessment results should be well documented. A strategy to achieve this is to gather samples of graded coursework and hold them in a centralized (to the department) location. Records of all aspects of the assessment process should be kept as well, such as evidence that curricular adjustments were made based on assessment.

   For physical materials in support of assessment and continuous improvement, the CEE/CS Department shares a storage facility with the Physics & Engineering Department. Electronic materials are stored on a campus shared drive and the campus Taskstream website.

2. It is not clear if the evaluation of course materials against the rubrics is being done by the a [sic] faculty other than the instructor himself/herself. It should be done by another faculty who is knowledgeable in the material and the evaluation should be documented.

   The department consulted with faculty from other universities with ABET accreditation and with our ABET consultant on this matter. We have determined that this is not necessary for successful ABET accreditation.

3. Although training on assessment processes may have been provided on campus, support should be considered for a faculty member (or more) to attend an ABET workshop on assessment who will then report to the department. It can be useful in clarifying ABET expectations and in providing ideas for what are appropriate assessment instruments and sustainable assessment processes.

   Multiple faculty within the department have attended ABET workshops and conferences to receive additional training. Our ABET consultant also provided training sessions during her two visits to CSUB.

4. Alumni should be surveyed to gage whether the expected objectives of the programs have been met.

   ABET no longer requires formal alumni surveys as part of the evaluation of the Program Educational Objectives (PEOs).

<u>Student Support</u>

1. The students should be guided to organize an active student organization in the department. The fact that the department already provides lab and study space for them, makes it easier for students to meet and participate in activities. The department should actively assist students in forming a student club.

   Two student clubs now exist specifically within the department: the Computer Science and Engineering Club and the IEEE Student Club. Additionally, students in both the CEE/CS Department and the Physics & Engineering Department participate in the Society of Women Engineers (SWE) Club.

2. A formal advisement process should be put in place. Advisement for each student should be documented at least once a year. Advisement should be done by tenure-track faculty, and in a balanced way to ensure that students are properly advised.

In response to this advice, students who previously saw lecturers for advising were reassigned to tenure-track faculty. Since our tenure-track numbers have not kept pace with our enrollments, this has had the unintended side-effect of greatly increasing the advising service load on tenure-track faculty. In 2014/15, we had four tenure-track faculty in Electrical and Computer Engineering (ECE) advising 200 ECE students. More seriously in Computer Science, due to unexpected leaves and retirements, we had two tenure-track faculty advising 200 Computer Science students in that same academic year.
In 2017/18, we have 300 Computer Science students advised by five CMPS faculty members and 250 Electrical and Computer Engineering students advised by four ECE faculty members. While the NSME Student Center helps alleviate some of the demand, particularly with lower-division students, these are unsustainable levels of advising.

3. The department should coordinate with other departments, especially Mathematics, when supporting courses should be offered, and when necessary the assistance of the dean should be sought.

NSME chairs came to an agreement that Mathematics will offer at least one section of the pre-calculus and calculus courses during the 10:00am time block each quarter. The CEE/CS department can then use the 10:00am time block for courses which have mathematics as a prerequisite or for additional sections of lower-division courses to handle extra demand.

4. The department should encourage the recruitment and retention of minorities and women.

Melissa Danforth, the department chair, has helped write multiple grants to support interventions that have been shown to improve success and retention of underrepresented minority and/or female students. The department has also been more active in outreach programs, including hosting multiple REVS-UP sections per summer for high school students.
The department follows all of the Provost Office guidelines for diverse recruitments of faculty members. We have made multiple offers to potential faculty from underrepresented groups, but have not always been successful at recruiting such faculty members.

<u>Faculty</u>

1. For ABET accreditation, it is necessary that teaching loads be kept to the 9-10 WTU level per quarter per faculty.

The expected teaching load for tenured/tenure-track faculty is 12 WTU per semester. Most of the ECE faculty also have either new faculty release time or grant release time to support their research programs. NSME also allows faculty who do not have other sources of release time to claim 1/3 WTU per student (to a maximum of 3 WTU per academic year) for students signed up for the 4800 Undergraduate Research courses in NSME departments.

2. Travel support should be provided to faculty that have papers accepted at professional conferences, at least once a year. The DOE grant may free department funds for this purpose, but institutional support should be available if the department cannot afford it.

The Provost's Office provides travel support to all tenured/tenure-track faculty to present at one conference per year (with monetary limits depending on faculty level). New faculty also receive additional support in their startup packages.

3. The commitment to hire two new faculty is crucial. The reviewer cannot see how the existing programs can be sustained and the computer engineering program be started without the two new hires.

The department had one ECE faculty when the external reviewer wrote this review. Four T/TT lines have been added since that time to support the ECE programs specifically, although one of these lines is currently being replaced. The search for that replacement faculty is happening during the 2017/18 academic year.

<u>Curriculum</u>

1. Complete separation of courses likely not being necessary, the department may want to revisit the issue of splitting the Computer Science and CIS Software tracks.

This is not applicable to Computer Engineering or Electrical Engineering. It will be addressed in the Computer Science program review.

Laboratories and Computing Facilities

1. It is recommended that a technical person is hired to assist in carrying out the maintenance of the software and hardware in the labs.

Henry Lin was hired as an equipment technician to support the engineering programs. He is responsible for the maintenance of the engineering hardware and for installation of engineering software in the labs.

Institutional Support and Financial Resources

1. The college and the institution in general should commit to baseline financial support of the programs beyond the period of the grants.

Support for the four T/TT lines added to support the ECE programs was added into position control when the U.S. Department of Education grant expired.

F. International Engineering Standards

Computer Engineering follows the standards set forth in both the ACM/IEEE Body of Knowledge for Computer Engineering and the Fundamentals of Engineering Exam for Electrical and Computer Engineering. Electrical Engineering follows the standards set forth in the Fundamentals of Engineering Exam for Electrical and Computer Engineering.

1. ACM/IEEE Body of Knowledge for Computer Engineering

The Computer Engineering program is primarily aligned with the 2004 ACM/IEEE Computer Engineering Body of Knowledge (referred to as CE 2004), as summarized in the following charts:

Table 4.3
The Computer Engineering Body of Knowledge

Computer Engineering Knowledge Areas and Units	
CE-ALG Algorithms [30 core hours] CE-ALG0 History and overview [1] *CE-ALG1 Basic algorithmic analysis [4] *CE-ALG2 Algorithmic strategies [8] *CE-ALG3 Computing algorithms [12] *CE-ALG4 Distributed algorithms [3] *CE-ALG5 Algorithmic complexity [2] *CE-ALG6 Basic computability theory	**CE-CAO Computer Architecture and Organization** [63 core hours] CE-CAO0 History and overview [1] CE-CAO1 Fundamentals of computer architecture [10] CE-CAO2 Computer arithmetic [3] CE-CAO3 Memory system organization and architecture [8] CE-CAO4 Interfacing and communication [10] CE-CAO5 Device subsystems [5] CE-CAO6 Processor systems design [10] CE-CAO7 Organization of the CPU [10] CE-CAO8 Performance [3] CE-CAO9 Distributed system models [3] CE-CAO10 Performance enhancements
CE-CSE Computer Systems Engineering [18 core hours] CE-CSE0 History and overview [1] CE-CSE1 Life cycle [2] CE-CSE2 Requirements analysis and elicitation [2] CE-CSE3 Specification [2] CE-CSE4 Architectural design [3] CE-CSE5 Testing [2] CE-CSE6 Maintenance [2] CE-CSE7 Project management [2] CE-CSE8 Concurrent (hardware/software) design [2] CE-CSE9 Implementation CE-CSE10 Specialized systems CE-CSE11 Reliability and fault tolerance	**CE-CSG Circuits and Signals** [43 core hours] CE-CSG0 History and overview [1] CE-CSG1 Electrical Quantities [3] CE-CSG2 Resistive Circuits and Networks [9] CE-CSG3 Reactive Circuits and Networks [12] CE-CSG4 Frequency Response [9] CE-CSG5 Sinusoidal Analysis [6] CE-CSG6 Convolution [3] CE-CSG7 Fourier Analysis CE-CSG8 Filters CE-CSG9 Laplace Transforms
CE-DBS Database Systems [5 core hours] CE-DBS0 History and overview [1] *CE-DBS1 Database systems [2] *CE-DBS2 Data modeling [2] *CE-DBS3 Relational databases *CE-DBS4 Database query languages *CE-DBS5 Relational database design *CE-DBS6 Transaction processing *CE-DBS7 Distributed databases *CE-DBS8 Physical database design	**CE-DIG Digital Logic** [57 core hours] CE-DIG0 History and overview [1] CE-DIG1 Switching theory [6] CE-DIG2 Combinational logic circuits [4] CE-DIG3 Modular design of combinational circuits [6] CE-DIG4 Memory elements [3] CE-DIG5 Sequential logic circuits [10] CE-DIG6 Digital systems design [12] CE-DIG7 Modeling and simulation [5] CE-DIG8 Formal verification [5] CE-DIG9 Fault models and testing [5] CE-DIG10 Design for testability

CE-DSP Digital Signal Processing [17 core hours]
- CE-DSP0 History and overview [1]
- CE-DSP1 Theories and concepts [3]
- CE-DSP2 Digital spectra analysis [1]
- CE-DSP3 Discrete Fourier transform [7]
- CE-DSP4 Sampling [2]
- CE-DSP5 Transforms [2]
- CE-DSP6 Digital filters [1]
- CE-DSP7 Discrete time signals
- CE-DSP8 Window functions
- CE-DSP9 Convolution
- CE-DSP10 Audio processing
- CE-DSP11 Image processing

CE-ELE Electronics [40 core hours]
- CE-ELE0 History and overview [1]
- CE-ELE1 Electronic properties of materials [3]
- CE-ELE2 Diodes and diode circuits [5]
- CE-ELE3 MOS transistors and biasing [3]
- CE-ELE4 MOS logic families [7]
- CE-ELE5 Bipolar transistors and logic families [4]
- CE-ELE6 Design parameters and issues [4]
- CE-ELE7 Storage elements [3]
- CE-ELE8 Interfacing logic families and standard buses [3]
- CE-ELE9 Operational amplifiers [4]
- CE-ELE10 Circuit modeling and simulation [3]
- CE-ELE11 Data conversion circuits
- CE-ELE12 Electronic voltage and current sources
- CE-ELE13 Amplifier design
- CE-ELE14 Integrated circuit building blocks

CE-ESY Embedded Systems [20 core hours]
- CE-ESY0 History and overview [1]
- CE-ESY1 Embedded microcontrollers [6]
- CE-ESY2 Embedded programs [3]
- CE-ESY3 Real-time operating systems [3]
- CE-ESY4 Low-power computing [2]
- CE-ESY5 Reliable system design [2]
- CE-ESY6 Design methodologies [3]
- CE-ESY7 Tool support
- CE-ESY8 Embedded multiprocessors
- CE-ESY9 Networked embedded systems
- CE-ESY10 Interfacing and mixed-signal systems

CE-HCI Human-Computer Interaction [8 core hours]
- CE-HCI0 History and overview [1]
- *CE-HCI1 Foundations of human-computer interaction [2]
- *CE-HCI2 Graphical user interface [2]
- *CE-HCI3 I/O technologies [1]
- *CE-HCI4 Intelligent systems [2]
- *CE-HCI5 Human-centered software evaluation
- *CE-HCI6 Human-centered software development
- *CE-HCI7 Interactive graphical user-interface design
- *CE-HCI8 Graphical user-interface programming
- *CE-HCI9 Graphics and visualization
- *CE-HCI10 Multimedia systems

CE-NWK Computer Networks [21 core hours]
- CE-NWK0 History and overview [1]
- CE-NWK1 Communications network architecture [3]
- CE-NWK2 Communications network protocols [4]
- CE-NWK3 Local and wide area networks [4]
- CE-NWK4 Client-server computing [3]
- CE-NWK5 Data security and integrity [4]
- CE-NWK6 Wireless and mobile computing [2]
- CE-NWK7 Performance evaluation
- CE-NWK8 Data communications
- CE-NWK9 Network management
- CE-NWK10 Compression and decompression

CE-OPS Operating Systems [20 core hours]
- CE-OPS0 History and overview [1]
- *CE-OPS1 Design principles [5]
- *CE-OPS2 Concurrency [6]
- *CE-OPS3 Scheduling and dispatch [3]
- *CE-OPS4 Memory management [5]
- *CE-OPS5 Device management
- *CE-OPS6 Security and protection
- *CE-OPS7 File systems
- *CE-OPS8 System performance evaluation

CE-PRF Programming Fundamentals [39 core hours]
- CE-PRF0 History and overview [1]
- *CE-PRF1 Programming Paradigms [5]
- *CE-PRF2 Programming constructs [7]
- *CE-PRF3 Algorithms and problem-solving [8]
- *CE-PRF4 Data structures [13]
- *CE-PRF5 Recursion [5]
- *CE-PRF6 Object-oriented programming
- *CE-PRF7 Event-driven and concurrent programming
- *CE-PRF8 Using APIs

CE-SPR Social and Professional Issues [16 core hours]
- CE-SPR0 History and overview [1]
- *CE-SPR1 Public policy [2]
- *CE-SPR2 Methods and tools of analysis [2]
- *CE-SPR3 Professional and ethical responsibilities [2]
- *CE-SPR4 Risks and liabilities [2]
- *CE-SPR5 Intellectual property [2]
- *CE-SPR6 Privacy and civil liberties [2]
- *CE-SPR7 Computer crime [1]
- *CE-SPR8 Economic issues in computing [2]
- *CE-SPR9 Philosophical frameworks

CE-SWE Software Engineering [13 core hours]
- CE-SWE0 History and overview [1]
- *CE-SWE1 Software processes [2]
- *CE-SWE2 Software requirements and specifications [2]
- *CE-SWE3 Software design [2]
- *CE-SWE4 Software testing and validation [2]
- *CE-SWE5 Software evolution [2]
- *CE-SWE6 Software tools and environments [2]
- *CE-SWE7 Language translation
- *CE-SWE8 Software project management
- *CE-SWE9 Software fault tolerance

CE-VLS VLSI Design and Fabrication [10 core hours]
- CE-VLS0 History and overview [1]
- CE-VLS1 Electronic properties of materials [2]
- CE-VLS2 Function of the basic inverter structure [3]
- CE-VLS3 Combinational logic structures [1]
- CE-VLS4 Sequential logic structures [1]
- CE-VLS5 Semiconductor memories and array structures [2]
- CE-VLS6 Chip input/output circuits
- CE-VLS7 Processing and layout
- CE-VLS8 Circuit characterization and performance
- CE-VLS9 Alternative circuit structures/low power design
- CE-VLS10 Semi-custom design technologies
- CE-VLS11 ASIC design methodology

Mathematics Knowledge Areas and Units	
CE-DSC Discrete Structures [33 core hours]	**CE-PRS Probability and Statistics** [33 core hours]
CE-DSC0 History and overview [1]	CE-PRS0 History and overview [1]
*CE-DSC1 Functions, relations, and sets [6]	CE-PRS1 Discrete probability [6]
*CE-DSC2 Basic logic [10]	CE-PRS2 Continuous probability [6]
*CE-DSC3 Proof techniques [6]	CE-PRS3 Expectation [4]
*CE-DSC4 Basics of counting [4]	CE-PRS4 Stochastic Processes [6]
*CE-DSC5 Graphs and trees [4]	CE-PRS5 Sampling distributions [4]
*CE-DSC6 Recursion [2]	CE-PRS6 Estimation [4]
	CE-PRS7 Hypothesis tests [2]
	CE-PRS8 Correlation and regression

In December 2016, the new ACM/IEEE curricular recommendations for Computer Engineering were published (referred to as CE 2016). This update primarily added the cybersecurity core area ("Information Security" in the below charts) and placed more emphasis on computer networking and embedded systems and less emphasis on operating systems than CE 2004. We are currently evaluating these new recommendations and have not yet changed our curriculum in response to the changes.

The complete ACM/IEEE curriculum recommendations are online at
https://www.acm.org/education/curricula-recommendations

2. Fundamentals of Engineering Exam in Electrical and Computer Engineering

The Fundamentals of Engineering Exam in Electrical and Computer Engineering must be taken and passed as the first step of becoming a registered and licensed Professional Engineer. The exam covers both areas of Computer Engineering and Electrical Engineering, so it is not a precise match for either degree program, but it has informed our curriculum development process. The required areas are:

1. Mathematics: algebra and trigonometry, complex numbers, discrete mathematics, analytical geometry, calculus, differential equations, linear algebra, vector calculus
2. Probability and Statistics: measures of central tendencies and dispersions, probability distributions, expected value, estimation for a single mean
3. Ethics and Professional Practice: codes of ethics from professional and technical societies, NCEES Model Law and Model Rules, intellectual property
4. Engineering Economics: time value of money, cost estimation, risk identification, analysis
5. Properties of Electrical Materials: chemical, electrical, mechanical, thermal
6. Engineering Sciences: work, energy, power, heat, charge, current, voltage, forces, capacitance, inductance, moving charge in an electric field
7. Circuit Analysis (DC and AC Steady State): KCL, KVL, series/parallel equivalent circuits, Thevenin and Norton theorems, node and loop analysis, waveform analysis, phasors, impedance
8. Linear Systems: frequency/transient response, resonance, Laplace transform, transfer functions, 2-port theory
9. Signal Processing: convolution, difference equations, Z-transforms, sampling, analog and digital filters
10. Electronics: solid-state fundamentals, discrete devices, bias circuits, amplifiers, instrumentation, power electronics
11. Power: single phase and three phase, transmission and distribution, voltage regulation, transformers, motors and generators, power factor
12. Electromagnetics: Maxwell equations, electrostatics/magnetostatics, wave propagation, transmission lines, electromagnetic compatibility
13. Control Systems: block diagrams, Bode plots, closed-loop and open-loop response, controller performance, steady-state errors, root locus, stability, state variables

14. Communications: basic modulation/demodulation concepts, Fourier transforms, Fourier series, multiplexing, digital communications
15. Computer Networks: routing and switching, network topologies/frameworks/models, local area networks
16. Digital Systems: number systems, Boolean logic, logic gates and circuits, logic minimization, flip-flops and counters, programmable logic devices and gate arrays, state machine design, data path/controller design, timing
17. Computer Systems: computer architecture, microprocessors, memory technology and systems, interfacing
18. Software Development: algorithms, data structures, software design methods, software implementation, software testing

G. Student Placement

1. Computer Engineering Graduates

Full Name	Placement	Job Type	Placement Details	Compl Term
Evan Bacon	Industry	Software Engineer	Software Engineer at Northrup Grumman	2123
Roland D. Oswald	Grad school	Grad School	Ph.D. program	2133
Alexander Hevle	Industry	Tech / Support Engineer	Cloud Support Engineer at Amazon	2131
Christopher George	Industry	Tech / Support Engineer	Technical Systems Support Engineer at UniFirst Corporation	2133
Heidi Sandoval	Government	Engineer	R & D Engineer II at Los Alamos National Laboratory	2143
Francis A. Alobba				2138
Robert Swanson				2143
Christian Elston	Grad school	Grad School	Masters at IWP	2143
Inderjit Bhogal	Industry		Position at CRC	2153
Gabriel Bertrand	Industry	Engineer	Computer Engineer at Fawkes Engineering, LLC	2153
Miles Heaton	Industry	Software Engineer	Software Test Engineer I at General Dynamics Mission Systems	2153
Carlo Buccat	Industry	Software Engineer	Associate Test Engineer at Kyocera Document Solutions	2153
Ezekiel De Leon	Industry	Software Engineer	Software Engineer at Johnson Controls	2153
John Gonzalez				2153
Mark Sindell	Industry	Software Engineer	Software Engineer at Northrup Grumman	2151
Kevin Mallard	Industry		Position at Cerner Corp	2153
Chase Cook	Grad school	Grad School	EE Ph.D. at UC Riverside	2153
Isaac Ennis				2163
Joshua Ward				2163
Sheriff Sadiqbatcha	Grad school	Grad School	EE Ph.D. at UC Riverside	2163
Francisco Quinones	Industry	Tech / Support Engineer	Technical Support Manager at Bolthouse Farms	2158
Juan Zamora	Industry	IT / System Admin	IT / Inventory Control at Golden Valley Orchard Supply	2163
Andres Rios				2163
Andrew VanBindsbergen	Industry	Software Engineer	Software Engineer at Bosch USA	2163
Joel Garcia				2163
Garret Ullal	Industry	IT / System Admin	Network Administrator at Hall Ambulance Service	2163
Yavisht Fitter				2173
Ivan Arambula	Industry	Software Engineer	Software Engineer at One Step Software	2168
Martin Martinez				2173

Jeffrey Celestino				2173
Ramandeep Sekhon				2173
Sean Davies				2173
Kody Bryan	Government	IT / System Admin	Systems Analyst at City of Bakersfield	2173
David Stanley				2173
Roy Banuelos	Industry	Software Engineer	Mainframe Programmer at Sunview Vineyards	2168

2. Electrical Engineering Graduates

Full Name	Placement	Job Type	Placement Details	Compl Term
Anthony Goyette	Industry	Engineer	Electrical Engineer at Chevron	2141
Alexander Cesare	Industry	Engineer	Instrumentation Engineer at Chevron	2143
Sulaiman Alkadashee	Industry	Engineer	Electrical Engineer at IES Engineering	2143
Michael Grishaber	Industry	Software Engineer	Senior System Analyst at IES Engineering	2143
Kevin Galloway	Industry	Software Engineer	Software Tools Engineer at Kyocera Document Solutions	2143
Travis Burns	Industry	Engineer	Engineer at General Atomics Aeronautical Systems	2143
Luis Medina				2148
Corey Ferdinand	Industry	Engineer	Automation Engineer at Process Automation Solutions	2148
Jose Ceja	Industry	Engineer	Control Engineer at Wonderful Pistachios	2153
Noe Terrazas				2153
Clarence Brumfield				2153
Martin Gomez				2153
Nick Bakich	Industry	Software Engineer	Software Developer at General Atomics Aeronautics	2153
Brian Schoene	Government	Engineer	Electrical Engineer at California Department of Water Resources	2158
James Vassar	Government		Mathematics teacher at Highland High School	2163
Kameron Arnold	Government	Engineer	Resident Engineer / Project Manager at City of McFarland	2163
Geromar Hasta	Government	Engineer	Transportation Engineer (Electrical) Intern at Caltrans	2163
Alejandro Ramirez				2163
Alexis Long	Industry	Engineer	Engineer at General Atomics Aeronautical Systems	2163
Todd Miller				2163
Edwin Borrero				2163
Jane Berk	Grad school	Grad School	Masters in Applied Math at CSU San Diego	2163
Jenny Villatoro	Grad school	Grad School	Masters in Biomed Eng at UC Riverside	2163
Talia Thompson	Industry	Engineer	Systems Engineer at Northrup Grumman	2165

Joshua Duschen				2165
Jose Escobar	Industry	Engineer	Systems Engineer at Priva Inc	2165
Jose Martinez				2168
Nathan Rhoads	Industry	Engineer	Electrical Designer at LSW Engineers California, Inc.	2168
Gerardo Gonzalez	Industry	IT / System Admin	IT Support Technician at Linebarger Goggan Blair Sampson LLP	2168
Danielle Gray				2168
Korey Cain	Grad school	Grad School	Masters at Oregon State University	2168
Juan Franco	Industry	Engineer	Electrical Engineer I at Mott MacDonald	2168
Timothy Guenther	Industry	Tech / Support Engineer	Panel Shop Manager at Esys: The Energy Control Company	2168
Jordan Root				2173
Garrett Pierce	Industry	Engineer	Electrical Engineer at Parsons Corporation	2173
Victor Almaral				2173
Eric DeLaRosa	Industry	Engineer	Electrical Engineer at B&A Engineering	2173
Christine Savala				2173
Sokhea Ly				2173
Emerson Argueta	Government		Research (Casual worker) at CSUB	2173
Rafael Martinez				2173

H. Curriculum Comparison to Other CSUs

1. Computer Engineering Comparison

	Bakersfield		Fresno (17-18)		Long Beach (14-15)		Chico (13-14)		Northridge (17-18)	
ABET?	Pending		Yes		Yes		Yes		Yes	
Core	64		63		66		73		60	
Cognate	31		34		29		30		36	
Core+Cognate	95		97		95		103		96	
GE	24		21		27		24		27	
Any additional university units	1		0		0		0		0	
Total	120		118		122		127		123	
Lower Division Core										
Introduction to engineering (Incl. college prep.)	ENGR 1618, 1628	4	ECE 1	1	ENGR 101, 102, CECS 105	3	-	0	-	0
Introductory Engineering Methods (MATLAB, plotting a graph, setting up experiments)	-	0	ECE 72[M]	2	CECS 100	3	-	0	-	0
Programming concepts I (Prog. fund)	CMPS 2010[C]	4	CSCI 40[C]	4	CEECS 174[Py], CECS 282[C]	6	CSCI 111[C]	4	COMP 110/L[J]	4
Programming concepts II (Data struct.)	CMPS 2020[C]	4	CSCI 41[C]	4	CECS 274[J]	3	CSCI 211[C]	4	COMP 182/L[J], 282	7
Discrete math (Discrete structures)	CMPS 2120	4	-	0	CECS 228	3	CSCI 217	3	Optional, cognate elective	0
Comp. arch. focusing on Assembly Language Programming (Comp arch. org. I)	-	0	ECE 118, 118L[***]	3	-	0	-	0	ECE 425/L[***]	4
Electric Circuits (LD Circuits, RLC, op amps)	ENGR 2070	4	ECE 90, 90L	4	CECS 211	3	EECE 211, 211L	4	ECE 240/L	4
Subtotal for Lower Division Core		20		18		21		15		19
Upper Division Core and Electives										
Comp. arch., design, memory, I/O (Arch. org. II)	CMPS 3240	4	ECE 115	3	CECS 440[MIPS]	3	EECE 320, 444	7	ECE 422	3
Dist. Par. Computing (Superscalar, parallel, distrib.)	-	0	ECE 174	3	-	0	-	0	-	0
Operating systems	CMPS 3600	4	-	0	CECS 326	3	-	0	-	0
Real time systems	-	0	-	0	-	0	EECE 437	4	-	0

Analog circuits (MOSFETS, Diodes, Freq. anal., transistor-level)	ECE 3070	4	ECE 128, 128L	4	CECS 440	3	EECE 311, 315	8	ECE 340/L, 442/L	8
Logic design (Comb., seq. gate-level design)	ECE 3200	4	ECE 85, 85L, 106[1]	7	CECS 201, 301	6	EECE 144	4	ECE 320/L	4
Adv. Logic Design (HDL and/or VLSI)	ECE 3220	4	ECE 176	3	-	0	EECE 344	4	ECE 420	3
Embedded systems	ECE 3250	4	ECE 178	4	CECS 262[C], 311	6	EECE 337[C]	3	-	0
Mechatronics, Control, Acquisition, A/D Interfaces	-	0	-	0	CECS 346, 347, 447	9	EECE 343, 482	8	-	0
Integrated circuit design (System on Chip, ASIC)	-	0	-	0	CECS 460, 463	6	-	0	-	0
Software Engineering	-	0	CSCI 150	3	-	0	CSCI 430	3	-	0
Computer networks (TCP/IP protocol stack)	-	0	-	0	-	0	EECE 555	4	-	0
Signals and systems	ECE 3040	4	ECE 124	4	-	0	EECE 365	4	ECE 350, 351	6
Digital Signal Processing	-	0	ECE 107	3	-	0	-	0	-	0
Numerical analysis (Error calc., regression, statistics)	-	0	-	0	-	0	-	0	ECE 309	2
Varying Upper Division Electives	Varies	12	Varies	9	Varies	3	Varies[****]	4	Varies	12
Senior Project (Design, capstone, etc.)	ECE 4910, 4928	4	ECE 186A, 186B	2	CECS 490A, 490B	6	EECE 490A, 490B	5	ECE 492, 493	3
Subtotal for Upper Division Core and Electives		44		45		45		58		41
Cognate Requirements										
Single Variable Calculus (Calc I)	MATH 2310	4	MATH 75	4	MATH 122	4	MATH 120	4	MATH 150A	5
Single Variable Calculus (Calc II)	MATH 2320	4	MATH 76	4	MATH 123	4	MATH 121	4	MATH 150B	5
Multivariable and Vector Calculus (Calc III)	MATH 2530	4	MATH 77	4	-	0	-	0	MATH 250	3
Calc. based physics (Phys I-III)	PHYS 2210, 2220	8	PHYS 4A, 4B, 4BL, 4C	10	PHYS 151, PHYS 152 or EE 210, 210L	12	PHYS 204A, 204B	8	PHYS 220A/L, 220B, 220BL	8
Professional Ethics (Prof. Development Skills)	PHIL 3318	3	ECE 103	2	-	0	CIVL 495	3	MSE 304	3
Engineering Economics (Risk Analysis)	-	0	-	0	-	0	CIVL 302	3	-	0
Introductory/General Chemistry and/or Biology	-	0	CHEM 3A	4	-	0	CHEM 111	4		6

Math/Sci Elective	-	0	-	0	Varies	3	-	0	Min. 6 units elective cognates	
Linear Algebra	MATH 2610	4	ENGR 101*,** or MATH 81**	3	-	0	-	0		
Differential Equations	-	0			CECS 271*	3	MATH 260	4	MATH 280	3
Probability theory (UD Stochastic processes, random processes, including probability courses taught by the ECE dept.)	MATH 3200	4	ECE 125	3	EE 380	3	-	0	ECE 450	3
Cognate Req. Subtotal		31		34		29		30		36

*Covers Laplace and/or Fourier transforms

**Covers both dif eq and lin alg

***Teaches comp. arch I (assembly language) after comp. arch II (design), often treated as UD rather than LD

****Chico allows students to take non-department upper division electives

[1]Fresno divided combinatorial circuits and sequential circuits into two different semester courses

[C]In C or C++

[Py]In Python

[J]In Java

[M]Matlab

[MIPS]MIPS assembly language

2. Electrical Engineering Comparison

	Bakersfield	Fresno (15-16)	Long Beach (17-18)	Chico (13-14)	Northridge (15-16)
ABET?	Pending	Yes	Yes	Yes	Yes
Core	56	60	64	66	52
Cognate	34	40	29	34	47
Core+Cognate	90	100	93	100	99
GE	24	24	27	24	27
Any additional university units	6	0	0	0	0
Total	120	124	120	124	126

Lower Division Core										
Introduction to engineering (May incl. college prep.) MATLAB, plotting, design problems)	ENGR 1618, 1628	4	ECE 1	1	EE 200, ENGR 101, 102	3	-	0	ECE 101/L	2
Programming concepts I (Prog. Fund. I)	CMPS 2010[C]	4	-	0	EE 186[C]	3	CSCI 111[C]	4	-	0
Engineering programming (MATLAB, Simulink)	-	0	ECE 71[C], ECE 72[M]	5	EE 202[M]	3	-	0	ECE 206/L[C]	3
Electric Circuits (LD Circuits, RLC, op amps)	ENGR 2070	4	ECE 90, 90L	4	EE 211, 211L	4	EECE 211, 211L	4	ECE 240/L	3
Subtotal for Lower Division Core		12		10		13		8		8
Upper Division Core and Electives										
Comp. arch., assembly language (Arch. org. I)	-	0	ECE 118, 118L	4	EE 346[AVR]	3	-	0		
Analog circuits (Transis., Freq. anal., transistor-level)	ECE 3070	4	ECE 102	3	EE 330	4	EECE 311	4	ECE 340/L	4
Advanced analog circuits (Bode plots, modulators)	-	0	ECE 128, 128L, 138, 128L	8	EE 430, 430L	4	EECE 315, 316	8	-	0
Logic design (Comb., seq. gate-level design)	ECE 3200	4	ECE 85, 85L	4	EE 201	3	EECE 144	4	ECE 320/L	4
Adv. Logic Design (HDL, FPGAs and/or VLSI)	-	0	-	0	EE 301	3	EECE 344	4	-	*0*
Embedded systems	-	0	-	0	-	0	EECE 337[C]	3	-	*0*
Control Systems (Root locus, system modelling)	ECE 3340	4	ECE 155	3	EE 370, 370L	4	EECE 482	4	ECE 480	3
Mechatronics, Control, Acquisition, A/D Interfaces	-	0	-	0	-	0	EECE 343	4	-	*0*
Signals and systems	ECE 3040	4	ECE 124	4	EE 310	3	EECE 365	4	ECE 350, 351	6
Digital Communications	ECE 3230	4	ECE 134	3	EE 382	3	EECE 453	4	-	0
Digital Signal Processing	-	0	-	0	EE 382	3	EECE 465	4	-	*0*
Fields and waves, eletromagnetism	ECE 3320	4	ECE 126	3	EE 360	3	ECE 375	3	ECE 370	3
Numerical analysis (Error calc., regression, statistics)	-	0	-	0	-	0	-	0	ECE 309	2
Power systems, electromechanical systems	ECE 3370	4	ECE 121	3	EE 350	3	EECE 481	4	-	0
Varying Upper Division Electives	Varies	12	Varies	11	Varies	12	Varies****	3	Varies	18
Senior Project (Design, capstone, etc.)	ECE 4910, 4928	4	ECE 186A, 186B, senior lab x2	4	EE 400D	3	EECE 490A, 490B	5	ECE 492, 493	4
Subtotal for Upper Division Core and Electives		44		50		51		58		44

Cognate Requirements										
Single Variable Calculus (Calc I)	MATH 2310	4	MATH 75	4	MATH 122	4	MATH 120	4	MATH 150A	5
Single Variable Calculus (Calc II)	MATH 2320	4	MATH 76	4	MATH 123	4	MATH 121	4	MATH 150B	5
Multivariable and Vector Calculus (Calc III)	MATH 2530	4	MATH 77	4	MATH 224	4	MATH 220	4	MATH 250	3
Calc. based physics (Phys I-III)	PHYS 2210, 2220	8	PHYS 4A, 4B, 4BL, 4C	10	PHYS 151, PHYS 152 or EE 210	8	PHYS 204A, 204B	8	PHYS 220A/L, 220B/L	8
Professional Ethics (Prof. Development Skills)	PHIL 3318	3	ECE 103	2	-	0	CIVL 495	3	MSE 304	3
Engineering Economics (Risk Analysis)	-	0	-	0	-	0	CIVL 302	3	-	0
Introductory/General Chemistry and/or Biology	CHEM 1000	3	CHEM 3A	4	-	0	CHEM 111	4	CHEM 101/L	5
Math/Sci Elective	-	0	Varies	3	-	0	-	0	-	0
Linear Algebra	MATH 2610	4	ENGR 101*,**		-	0	-	0	ECE 455	3
Differential Equations	-	0	or MATH 81**	3	MATH 370A	3	MATH 260	4	MATH 280	3
Probability Theory (UD Stochastic processes, random processes, including probability courses taught by the ECE dept.)	MATH 3200	4	ECE 125	3	EE 380	3	-	0	ECE 450	3
Statics (ME/physics)	-	0	-	0	-	0	-	0	CE 240	3
Thermodynamics (ME/physics)	-	0	Varies	3	-	0	-	0	ME 370 or 375	3
Material sciences (Metals, polymers, crystaline struct.)	-	0	-	0	EE 220 or PHYS 254	3	-	0	MSE 227	3
Cognate Req. Subtotal		34		40		29		34		47

*Covers Laplace and/or Fourier transforms

**Covers both dif eq and lin alg

****Chico allows students to take non-department upper division electives

[C]In C or C++

[M]Matlab

[AVR]Amtel AVR