Academic Program Review
MS Electrical and Electronic Engineering

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APRC Recommendation to Faculty Senate
MS Electrical and Electronic Engineering

The Academic Program Review Committee (APRC) affirms that the Department of Electrical and Electronic Engineering has completed program review as per policy, including self-study, external review, internal review, and action plan submission for the MS Electrical and Electronic Engineering. APRC recommends that the next program review be scheduled for six years from Faculty Senate approval; or, should the College of Engineering and Computer Science decide to schedule a college-wide program review, the next program review will occur at that time.

APRC Chair: Jeffrey Brodd, Professor of Humanities and Religious Studies

Department Electrical & Electronic Engineering
California State University, Sacramento

Graduate Program - Self-Study Report

Date: December 2022

Date of Last Review: February 2011

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Element One: Mission and Context

A. University, College and Academic Unit Missions

Mission of California State University, Sacramento (Sacramento State): As California's capital university, we transform lives by preparing students for leadership, service, and success. Sacramento State will be a recognized leader in education, innovation, and engagement.

Mission of College of Engineering & Computer Science (ECS): Through contemporary curricula, engaging pedagogy, scholarship and applied research, we produce career-ready graduates prepared for a lifetime of professional achievement and intellectual growth.

Mission of the Department of Electrical & Electronic Engineering (EEE): The Master of Science degree program in Electrical & Electronic Engineering is designed to provide students with advanced study in a variety of Electrical and Electronic Engineering topics, and opportunities to conduct independent research to broaden their professional scope.

B. Degrees Offered, with Link to the University Catalog

MS in Electrical & Electronic Engineering (EEE)

Units Required for the MS: 30

Minimum Cumulative GPA: 3.0. No more than three (3) courses in the program of study may have a grade below "B" and no course may have a grade below "C+".

Certificate in Mixed-Signal Integrated Circuit Design

Units required for Certificate: 16

In addition, the EEE department also offers an ABET accredited Bachelor of Science (BS) degree.

C. Minors Offered, with Link to the University Catalog

There are no minors offered by the EEE Department.

Students in the MS program focus their studies in one or more of the following specialization areas, adapting to the needs and interests of the practicing engineer or post-graduate candidate:

- Control Systems
- Communication Systems
- Power Systems
- Microelectronic Design
- Computer Architecture & Digital Design

D. Service to or From Other Departments, Degree Programs, and/or General Education

Computer Engineering program (CpE): The Electrical & Electronic Engineering Department (jointly with the Computer Science (CSc) Department) sponsors and supports the Computer Engineering program to offer both BS-CpE and MS-CpE degrees in Computer Engineering. This arrangement has the advantage of support from two strong departments to support the CpE's BS

and MS degree programs. The EEE department routinely offers many of the courses required in the CpE curriculum. The faculty in the CpE program are elected from the EEE and CSc departments and serve the program as well as their home departments.

Technician Support: The ECS Technician Shop provides technical and material support to EEE's instructional laboratories. Additionally, the ECS Tech Shop supports undergraduate and graduate projects, as well as funded research projects. Three full-time technicians and several student assistants provide technical support to the college community. The EEE program is supported primarily by the electrical/electronic technician, Mr. R.K. Ravuri, who reports to the EEE department chair and provides services to all EEE laboratories. His responsibilities include maintenance operations and equipment repairs. The EEE technicians also oversees the EEE Tech shop which typically employs two part-time student assistants. The Tech shop assists faculty and students in their research and curricular activities.

Computing Support: The College of Engineering and Computer Science's (ECS) Computing, Communications & Academic Technology Services (CCATS) is the integrated Information and Academic Technology (IT/AT) unit for the College. ECS Computing Services is a part of the Dean's Office and serves all faculty, staff and students of the College. It is the College-wide support entity charged with implementing and supporting the ECS Information Technology Plan, and provides comprehensive IT/AT support to the College.

This support includes hardware, software, networking and consulting for both academic and research computing and communications. CCATS manages all the College's computing facilities, including servers for academic computing, DB, LMS, Cloud Storage and Web Hosting, as well as Windows or Linux workstation-equipped laboratories containing 600+ workstations and the College's local area network. Computer accounts are maintained for approximately 5000 faculty, staff, projects and students. The CCATS has evolved significantly over the years and today is focused on supporting the ECS through a highly distributed and virtualized computing and communications environment.

E. External Educational Partnerships

Institute of Electrical and Electronics Engineers (IEEE): The IEEE is the largest technical society in the world comprising of over 300 sections in all continents. The IEEE Sacramento Valley Section has active participation by multiple faculty in our Department. The Chair, Vice Chair, Secretary and other offices of this chapter are all traditionally managed by EEE faculty. The IEEE Sacramento Valley Section also supports many society chapters that relate to the technical areas within the broad field of Electrical Engineering:

- IEEE Power Engineering Society
- IEEE Photonics Society
- IEEE Vehicular Technology/Communications Society
- IEEE Power & Energy/Industrial Applications Society
- IEEE Computer Society

IEEE student members (undergraduate and graduate) also maintain an active IEEE Sacramento State Student Branch. The IEEE Student Branch conducts several technical and social events that benefit our students; examples are invited talks from people in industry such as Chevron, PG&E,

resume workshops, Evening with Industry. The IEEE Student Branch is assigned a faculty member from the EEE Department to act as adviser.

DMEA Educational Partnership: For over 20 years, the EEE Department has had an Educational Partnership Agreement (EPA) with the Defense Microelectronics Activity (DMEA) at McClellan Park in Sacramento. This has proven to be a mutually beneficial agreement for both parties. DMEA has benefited by hiring many of our students who get a BS in EEE degree, and by sending them back to Sacramento State to get an MS in EEE degree, specializing in analog and mixed-signal integrated circuit (IC) design. The specialized knowledge their engineers gain by pursuing EEE's MS degree is critically important to the success of their work designing mixed-signal integrated circuits. In fact, the current Director of DMEA, Nick Martin, got his EEE MS degree studying mixed-signal IC design at Sacramento State.

This close relationship has also greatly benefitted the EEE Department and our students. For example, DMEA has donated a substantial amount of equipment to EEE over the years. They have also sponsored cooperative research projects focusing on new mixed-signal IC designs, by providing both expert advice and silicon fabrication services in advanced CMOS processes at no cost to EEE. The most recent example of this was the design of a new type of level-crossing Analog-to-Digital Converter (ADC) in 90nm CMOS that a team of our EEE MS students designed in AY2019-20. This type of hands-on, practical experience designing real world integrated circuits is invaluable for our students and would not have been possible without the support of DMEA.

Additional Industry Relations: The EEE Department also enjoys longstanding relations and partnerships with numerous other industries with regional and global presence like Intel, SMUD, PG&E, Cadence Design Systems, ARM, Xilinx, etc. These partnerships resulted in significant equipment, software, monetary and other in-kind donations to the EEE department over the years to support our MS program.

F. Major Structural Changes in Academic Unit Since Last Review (new, moved, or discontinued degrees, concentrations, minors, etc.)

Computer Engineering (CpE) Program as independent entity: When the CpE program was first established in 1984, it was implemented as a joint program between Computer Science (CSc) and the EEE departments, as it is now. The program was solely managed by the EEE department from Fall 2009 to Fall 2014. In Fall 2014, the two departments decided that the CpE program would be best managed by a separate coordinator elected by the CpE faculty. Since Spring 2015, the CpE program has been independently managed by a coordinator elected by the CpE faculty. The CpE's MS (and BS) degree is fully supported through the courses offered by the EEE and the CSc Departments. The transition of CpE from being fully managed by EEE to having an independent standing as a program is a structural change to the EEE Department since the last review in February 2011.

EEE 201 – Research Methodology course update: EEE 201 is a seminar course that is required for all incoming graduate students in the first semester. The main function of the course is to train graduate students in writing, conducting effective research and assisting them to decide on specialization choices. Since Fall 2021, the EEE 201 has been updated to 2 units of credit (from 1 unit), with additional writing intensive assignments. The 2-unit EEE 201 course can now be counted towards the Graduate Writing Assessment Requirement (GWAR) requirement for the

degree, and has replaced the previously conducted writing exam. This structural change to the MS program implements the recommendation from the past graduate program reviewer's report, dated February 2011. Specifically, the previous reviewer Dr. Michael Ward recommended this change to EEE 201 to satisfy the university requirement for a graduate writing intensive course.

EEE Graduate Program Learning Objectives: The Program Learning Objectives (PLOs) for the EEE department's graduate program are listed in Element Two. The current PLOs include six outcomes that replaced ten student learning outcomes from the previous assessment cycle, as recommended by the past evaluator. The new PLOs are detailed in Element Two.

Element Two: Program Learning Outcomes and Assessment

A. Program Learning Outcomes

The Program Learning Objectives (PLOs) for the EEE department's graduate program are listed below. The current assessment (and the graduate program) includes six program learning outcomes that replaced ten student learning outcomes in the past assessment report, as suggested by the evaluator. The *Institutional Learning Goals* (*ILGs*) for graduate programs at Sacramento State are shown in parentheses.

- **PLO1:** Apply core and advanced Electrical & Electronic Engineering knowledge and skills to synthesize and analyze as a part of the design process. (***ILG1: Disciplinary Knowledge*)**
- **PLO2:** Effectively communicate the theory, function, and practical aspects of an electrical and/or electronic system. (***ILG2: Communication***)
- **PLO3:** Apply contemporary engineering techniques and tools for analysis and design (***ILG3: Critical Thinking/Analysis***)
- **PLO4:** Organize relevant information needed to address engineering problems (***ILG4: Information Literacy***)
- **PLO5:** Integrate/Propose/Employ timely and appropriate decisions in the engineering workplace (***ILG5: Professionalism***)
- **PLO6:** Propose engineering solutions that would benefit global environment and society (***ILG6: Intercultural/ Global Perspectives***)

B. Summary of Data for Each Learning Outcome

Course Embedded Assessment (Direct Measurement)

Course Embedded Assessment (Direct Measurement) of PLOs represents the "bricks and mortar" of our assessment process. In the tables 1 – 6 below, we present the number of students "Meeting or Exceeding Expectations" for each PLO, based on course level exams, projects, reports and other student work in various courses.

- **PLO1 (Apply core and advanced EEE knowledge and skills):** Assessed in some of the elective core courses (from final exam), corresponding to the areas of specialization in our graduate degree program. Students are required to select at least two core areas of their choice within the program.

Course/Area	2020/2021	2021/2022
EEE 230 (Microelectronic Design)	86.4%	85.7%
EEE 250 (Power Systems)	75%	71.4%
EEE 260 (Communication Systems)	100%*	100%

Table 1. Assessment data in elective core courses for PLO1
Percentage of students "Meeting or Exceeding Expectations" in final exam is shown.
** Data was obtained from Fall 2019 semester (last offering before 2021/2022 period)*

PLO1 is also additionally assessed in the Culminating Experience, Plan C (Comprehensive exam), in which students are tested on their knowledge and command of courses in the EEE graduate program. The Comprehensive exam is conducted twice a year (March and October). The past 10-year success rate in the exam (percentage of students with passing score of 70% or higher) is shown below in Figure 1.

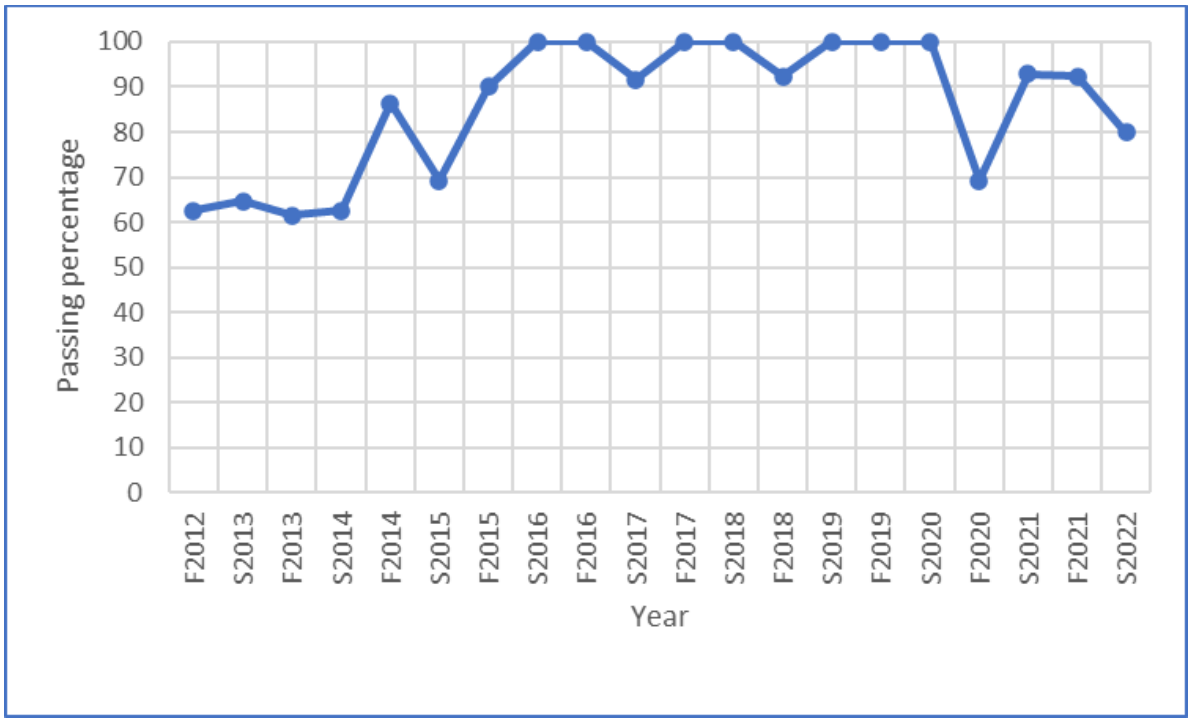

Figure 1. Percentage of students passing Plan C Comprehensive exam

- **PLO2 (Effectively communicate theory, function, and practical aspects of EEE systems):** Assessed from projects in courses that are required for all students in the MS program. The assessment is done based on evaluation of the project reports and checking if all the components of the reports, such as referencing, formatting and content are satisfactory.

Course	2020/2021	2021/2022
EEE 201 (Research Methodology)	41.2%	50%
EEE 244 (Computational Methods)	100%	88.5%

Table 2. Assessment data in required courses for PLO2

Percentage of students "Meeting or Exceeding Expectations" in course projects shown.

- **PLO3 (Apply contemporary engineering techniques and tools for analysis and design):** Assessed from projects in some of the elective core courses corresponding to the areas of specialization in the MS program. The assessment is done based on evaluation of the project reports.

Course/Area	2020/2021	2021/2022
EEE 230 (Microelectronic Design)	81.1%	89.3
EEE 250 (Power Systems)	75%	75%
EEE 260 (Communication Systems)	88.8%*	80%

Table 3. Assessment data in elective core courses for PLO3
Percentage of students "Meeting or Exceeding Expectations" in course projects shown.
** Data was obtained from Fall 2019 semester (last offering before 2021/2022 period)*

- **PLO4 (Organize relevant information needed to address engineering problems):** Assessed in the introductory seminar course, EEE 201: Research Methodology and EEE 500: Thesis/Project (from reference collection). The aim of EEE 201 is to train students in writing and research planning. This assessment is done based on evaluation of reference lists/bibliography created by students. The references are assessed for relevance, inclusion of appropriate disciplinary journal/conference articles, discipline specific citation formatting, etc. Data in EEE 500 is measured based on references in reports in Spring 2020 to Fall 2022.

Course	2020/2021	2021/2022
EEE 201 (Research Methodology)	94.1%	100%
EEE 500 (Thesis/Project)	100%	80%

Table 4. Assessment data in required course for PLO4
Percentage of students "Meeting or Exceeding Expectations" in bibliography shown.

- **PLO5 (Professionalism/Integrate timely and appropriate decisions in the engineering workplace):** Assessed in the introductory seminar course, EEE 201: Research Methodology and EEE 500: Thesis/Project (from project writing match). This assessment is done based on the degree of match between student project reports and online sources, as obtained from use of the Turnitin software. All EEE 500 projects require a matching score below 15%.

Course	2020/2021	2021/2022
EEE 201 (Research Methodology)	47.1%	50%
EEE 500 (Thesis/Project)	100%	100%

Table 5. Assessment data in required course for PLO5
Percentage of students "Meeting or Exceeding Expectations" in Turnitin check shown.

- **PLO6 (Propose engineering solutions that would benefit global environment and society):** Assessed in the Culminating Experience (Thesis/Project) for all students (from relevance of the project/research topic to wider societal and global issues). Students are

strongly encouraged to consider the significance of their project/research in wider societal and global contexts. The relevance of the topic is assessed based on the project report or thesis document and student presentation.

Course	2020/2021	2021/2022
EEE 500 (Thesis/Project)	26.3%	44.4%

Table 6. Assessment data in Culminating Experience (Thesis/Project) for PLO6
Percentage of students "Meeting or Exceeding Expectations" in project reports/theses shown.

C. Analysis for Each Learning Outcome, Including How to Maintain Success and Improve Learning

- **PLO1 (Core and advanced EEE knowledge and skills):** Table 1 summarizes data for this outcome over the past two years. The satisfactory performance rate in the elective core courses is generally around 70% or higher, which is acceptable, with some room for improvement. This outcome is also assessed in the Plan C: Comprehensive exam, which is the alternative to the thesis/project option for EEE graduate students. The passing rate in the exam over the past 10 years shows some fluctuation, maintaining an average of approximately 80% (see Figure 1 above).

- **PLO2 (Effectively communicate theory, function, and practical aspects of EEE systems):** Table 2 summarizes data for this outcome over the past two years. It is interesting to note that the satisfactory rate of this outcome in the EEE 244: Computational Methods course is significantly better than in the EEE 201: Research Methodology course. Both these courses are mandatory for all beginning first-semester EEE graduate students; however, students start a project in the EEE 201 course and test the simulation only for errors, while they expand the study in the EEE 244 course. Additionally, the EEE 201 is graded only for Credit (CR) grade, while the EEE 244 is assigned a letter grade (A and lower). These might be factors to account for the difference in satisfactory percentage for the same outcome from two different courses.

- **PLO3 (Apply contemporary engineering techniques and tools for analysis and design):** Table 3 summarizes data for this outcome over the past two years. The satisfactory performance rate in the elective core courses is generally around 75% or higher, as evaluated by students' approach and presentation of term project reports.

- **PLO4 (Organize relevant information needed to address engineering problems):** Table 4 summarizes data for this outcome over the past 2 years. Generally, the performance of students seems to be excellent at ~ 80% or higher, and students are able to access and list relevant reference sources satisfactorily.

- **PLO5 (Professionalism/Integrate timely and appropriate decisions in the engineering workplace):** Table 5 summarizes data for this outcome over the past two years. In the EEE 201 course which is taken in the first semester, it is seen less than 50% of student reports are not reaching satisfactory levels of original content in writing. It is acceptable for students to access material for their reports from external sources,

including the internet; however, further training is required to improve students' ability to appropriately reference and present material in their own words.

However, eventually by the time students reach the culminating experience course: EEE 500, faculty require all the student reports to meet or exceed expectations before they are submitted to the Office of Graduate studies, and we see a significant improvement towards a score of 100%.

- **PLO6 (Propose engineering solutions that would benefit global environment and society):** Table 6 summarizes data for this outcome over the past two years. The percentages shown reflect the number of thesis/project topics that are directly relevant to global issues. While all graduate projects have some useful applications, examples of EEE project topics that have components of global relevance are research in renewable energy sources such as wind and solar, and traffic mitigation techniques such as Smart Parking.

D. Other Relevant Data (Student Surveys, Alumni, Internships, etc.) and How Data is Used to Maintain Success and Improved Learning.

Program Level Assessment (Indirect Measurement)

Assessment of the PLOs at the program level is carried out by using a variety of indirect assessment tools:

- Graduate student and alumni surveys reflecting on program outcomes.
- Site visits to industry.
- Independent assessment by Department-level Industry Representatives.
- Feedback from College's Industry Advisory Board.
- Employability statistics of our graduate students.

Since faculty are primarily responsible for assessment, we use faculty surveys to set indicators as appropriate for our program outcomes. In some instances, it is more appropriate to use qualitative indicators to assess the success of a particular outcome (typically feedback and action items resulting from independent assessment by the department's Industry Representatives) as described in Element Three. Below, we describe some of the indirect measures listed above.

- **Graduate Alumni Survey:** The following survey with 7 questions was sent to EEE graduate alumni (who graduated with MS in EEE in the past 10 years), to obtain their feedback on the extent to which the EEE program achieved its PLOs in their view. The questions (shown below) were designed to align with the PLOs and the ILGs. Please refer to Section A of Element Two for the PLOs and ILGs. The survey choices for each of the questions 1 – 6 below were: a) Significant Extent b) Adequate Extent c) Marginal Extent and d) Not Applicable. Question 7 below sought open ended feedback.

Graduate Alumni Survey

Please complete the following questions, based on your experience as a graduate student in the EEE Department at Sacramento State University.

To what extent did the program help you develop the following knowledge or proficiencies:

1. **Disciplinary Knowledge:** The ability to apply core and advanced EEE knowledge and skills to solve engineering problems.
2. **Communication:** The ability to effectively communicate theoretical and practical aspects of your discipline.
3. **Contemporary Tools:** The ability to apply contemporary engineering techniques and tools for analysis and design.
4. **Information Literacy:** The ability to access relevant information from discipline specific literature to address engineering problems.
5. **Professionalism:** The ability to make timely and professional decisions in your workplace.
6. **Intercultural/Global Perspectives:** The ability to understand the relevance and impact of EEE disciplinary knowledge in the wider societal and global contexts.
7. In your view, what are two strengths and two areas for improvement in the EEE Graduate program?

The percentage of alumni who reported "Significant Extent" and "Adequate Extent" of preparation from the graduate program is presented in the Table 7 below, for each PLO.

PLO	Corresponding ILG	Percentage (Significant + Adequate extent)
PLO1	ILG1	81.25%
PLO2	ILG2	78.13%
PLO3	ILG3	75%
PLO4	ILG4	81.26%
PLO5	ILG5	83.87%
PLO6	ILG6	81.25%

Table 7. Assessment data from Alumni Survey for PLOs 1 – 6 (32 respondents to survey) % of alumni reporting "Significant Extent" and "Adequate Extent" of preparation is shown.

Qualitative feedback from question – 7 about the strengths and areas of improvement in the graduate program are collated and summarized in Table 8 below.

Strengths	Areas for improvement
Deep insight to micro-electronics and analog circuits.	… include Java, Python, Linux, etc.
Excellent and professional team of professors…	Adding more courses into Digital design, verification and computer architecture
Theoretical approach was good…	graduate students should be taken to field trips relevant to their areas.
Career readiness is strength.	

Table 8. Qualitative feedback from Alumni Survey (32 respondents to survey)

- **Employability statistics of EEE graduate students:** Another indirect metric used to assess the strength of EEE's MS program at the program-level is the employability of our graduate students, post-graduation. The College of Engineering and Computer Science (ECS) Internship & Career Services Office collects and disseminates data on the post-graduation employment, based on students who responded to the post-graduation First Destination survey. Table 9 below shows the percentage of graduate students employed in their field, right before completing MS degree in EEE in 2021.

Employment status for 2021 Graduates	Percentage
Already employed in the field of MS study	64.70%
Still seeking employment in field of MS study	17.65%
Employed in a field not related to MS study or enrolled in continuing study.	17.65%

Table 9. Employability of EEE's MS graduates (17 respondents to survey)
Survey administered right before graduation.

E. Comprehensive Assessment Plan

The EEE department's graduate PLOs are assessed in two ways: Course Level Assessment and Program Level Assessment, as detailed below.

- **Course Level Assessment (Direct Measurement)**
  Course Embedded Assessment represents the "bricks and mortar" of our assessment program. Our experience shows that assignments and exams in individual courses provide immediate and valuable feedback to both the student and the faculty. Assignments and examinations including mid-terms and finals are required in all courses. In addition, projects, Computer Aided Design, and term papers are required in several classes as appropriate. They allow the faculty to identify any potential problems in related courses, or lapses in prerequisite preparation.

  Three core courses are required for all EEE graduate students:

  EEE 201: Research Methodology
  EEE 244: Computational Methods
  EEE 500: Culminating Experience (Thesis/Project/Comprehensive exam)

  Thesis: 5 units
  Project: 2 units
  Exam: 0 units

  In addition, since Electrical Engineering has different fields of specialization, students are required to choose at least 2 courses from the following **elective core courses**:

  EEE 241: Linear Systems - Elective core course for Control Systems specialization

  EEE 211: Microwave Engineering – Elective core course for Communication Systems (Circuits) specialization

EEE 260: Statistical Theory of Communication – Elective core course for Communication Systems (Systems) specialization

EEE 250: Advanced Analysis of Faulted Power Systems– Elective core course for Power Systems specialization

EEE 230: Analog and Mixed Signal Integrated Circuit Design– Elective core course for Microelectronic Design specialization

EEE 285: Micro-Computer System Design I– Elective core course for Computer Architecture & Digital Design specialization

Table 10 below maps the PLOs to the Core and Elective core courses in the EEE graduate Program:

Course	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
EEE 201: Research Methodology		x		x	x	
EEE 244: Computational Methods		x				
EEE 241: Linear Systems Analysis	x		x			
EEE 211: Microwave Engineering	x		x			
EEE 260: Statistical Theory of Communication	x		x			
EEE 250: Advanced Analysis of Faulted Power Systems	x		x			
EEE 230: Analog and Mixed Signal Integrated Circuit Design	x		x			
EEE 285: Micro-Computer System Design I	x		x			
EEE 500: Culminating Experience				x	x	x

Table 10. Mapping of PLOs with program courses

Element Three: Student Success

The faculty members in the EEE program interact with the students in various ways, particularly through teaching and advising. In the first semester of the graduate program, all graduate students are introduced to the EEE specific graduate forms and are required to meet with an academic advisor and submit their EEE advising forms. The EEE specific graduate forms are listed below:

- **Advising Form**
- **Graduate Process Flowchart**
- **Plan C Course Approval**
- **EEE 500 Topic Form**

In addition to classroom interactions, students and faculty interact during office hours. Full-time faculty members in the EEE department are required to have at least three office hours per week. It is very common for the EEE faculty to schedule meetings with students outside of their official office hours. Some faculty members have open door policy. Part-time instructors who teach lecture classes have access to shared office space and are generally available for a while before and after each class. Part-time instructors who teach laboratory classes usually have enough time for student contact in their respective laboratories. During the COVID-19 pandemic, our faculty maintained virtual office hours to continue one on one interaction with students.

A. Admission Data Disaggregated by Gender and Ethnicity

All data presented in this section was obtained from the CSUS ORIEP Office.

General admission data for the EEE M.S. program for the AY 2016-2022 is shown in Table 11 and a typical view of ethnicity and gender distribution of EEE M.S. admissions for Fall 2021and 2022 is shown in Figures 2 and 3 respectively.

Year	2016	2017	2018	2019	2020	2021	2022
Students applied	219	169	152	138	82	151	128
Students admitted	109	111	87	109	66	125	95

Table 11. EEE Graduate program admission numbers 2016-2021

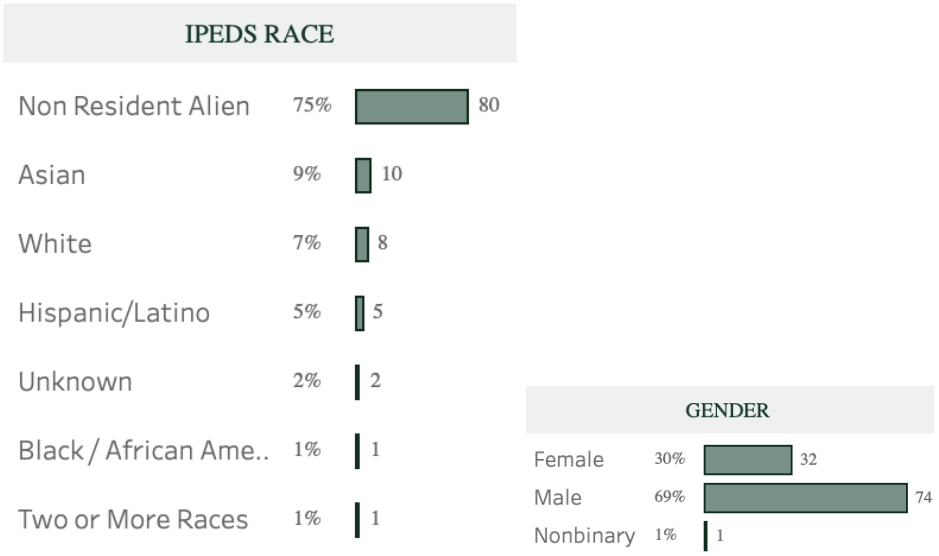

Figure 2. Ethnicity distribution of EEE graduate students – Fall 2021
Source *Integrated Postsecondary Education Data System (IPEDS)*: *https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html*

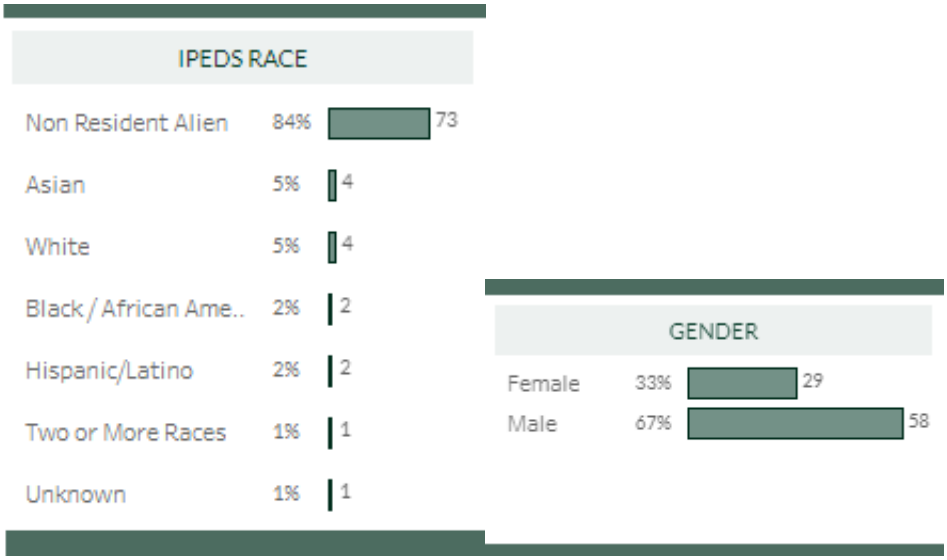

Figure 3. Ethnicity distribution of EEE graduate students – Fall 2022
Source *Integrated Postsecondary Education Data System (IPEDS)*: *https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html*

As seen above, a majority of our graduate applicants (above 75%) are international, and the ethnicity distribution within international applicants is shown below in Figure 4 and Figure 5 respectively for Fall 2021 and Fall 2022 semesters.

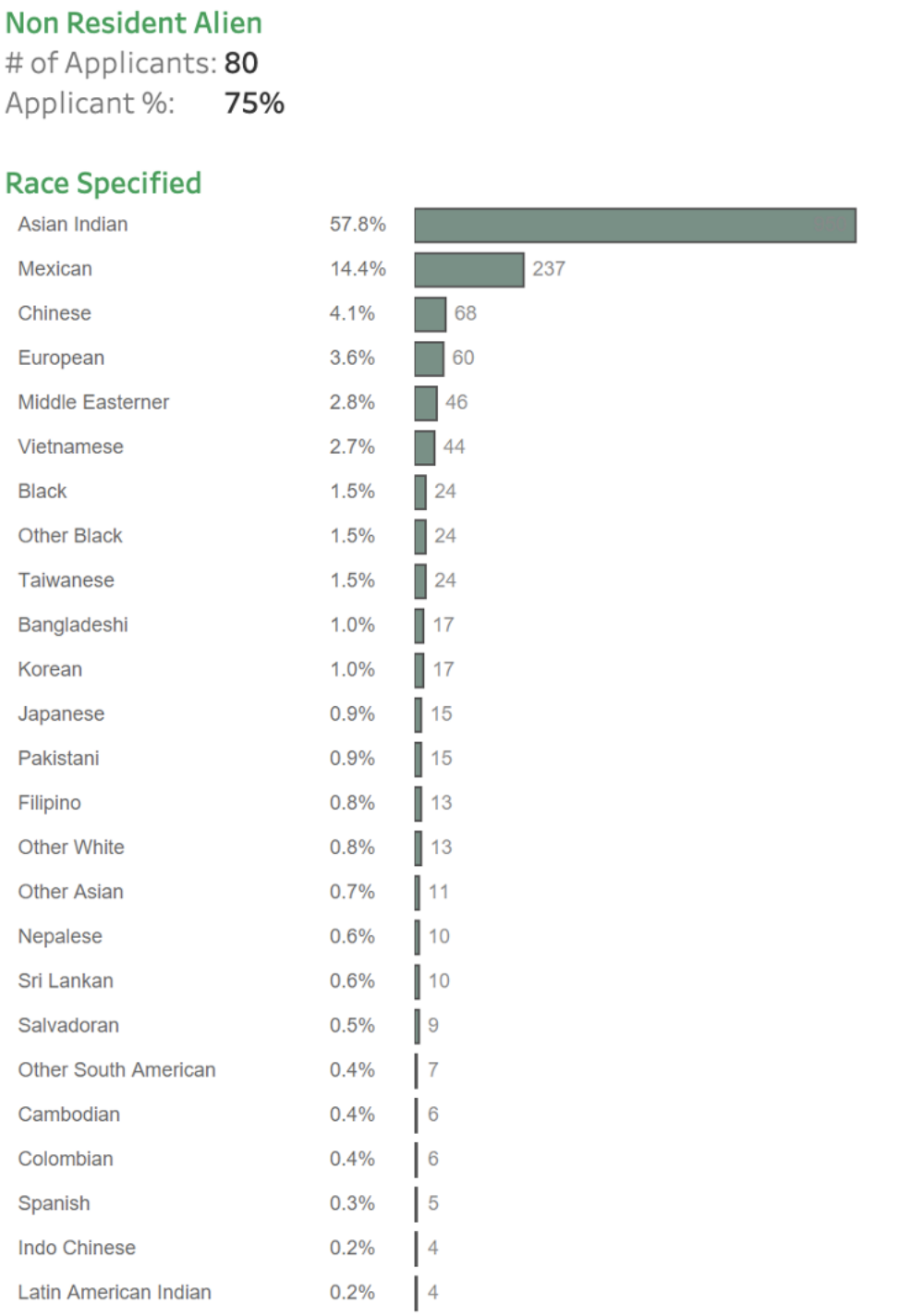

Figure 4. Ethnicity distribution of EEE international graduate students – Fall 2021
Source *Integrated Postsecondary Education Data System (IPEDS)*:
https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html

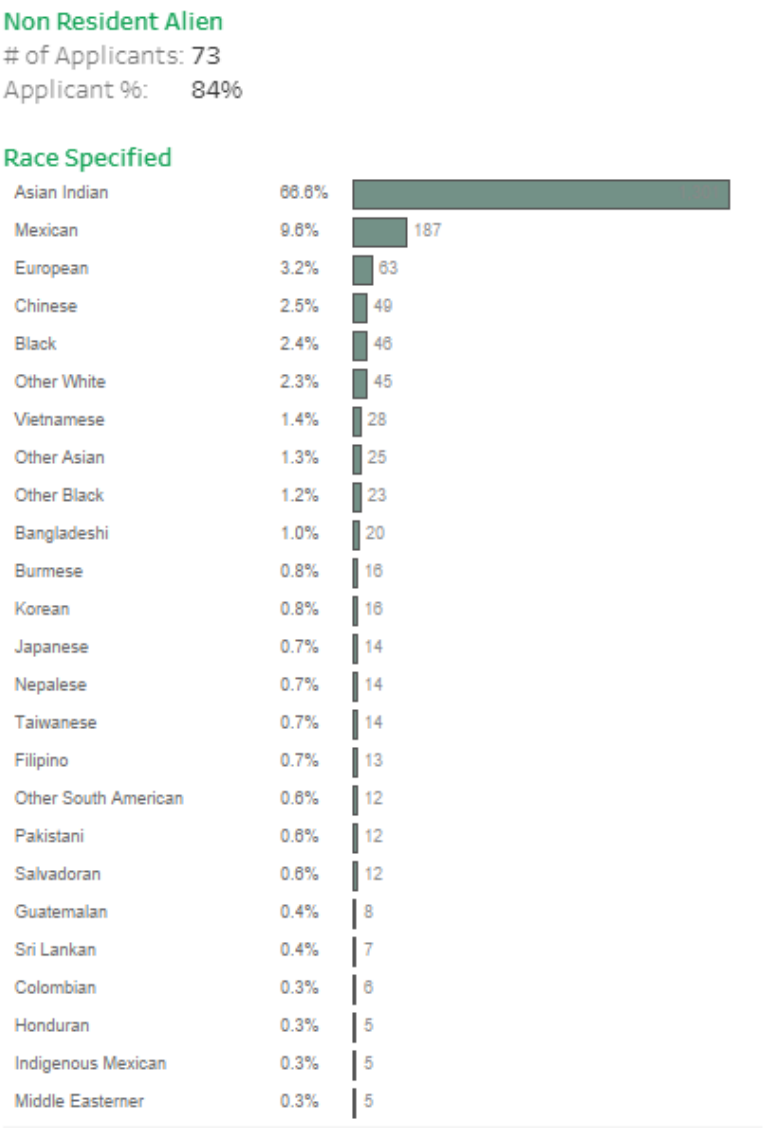

Figure 5. Ethnicity distribution of EEE international graduate students – Fall 2022
Source *Integrated Postsecondary Education Data System (IPEDS)*:
https://www.csus.edu/president/institutional-research-effectiveness-planning/dashboards/admissions.html

B. Retention Data Disaggregated by Gender and Ethnicity

The 10-year history of student headcount in the EEE graduate program is shown below in Figure 6. Student count reached a peak in 2014-2015 with steady decline over the past 5 years. Retention numbers are not specifically provided by the university for graduate programs; however, from department records, it is almost 100%. Very rarely, a student might transfer to a related program such as Computer Engineering (CpE) with similar rare transfer from an external department to the EEE graduate program.

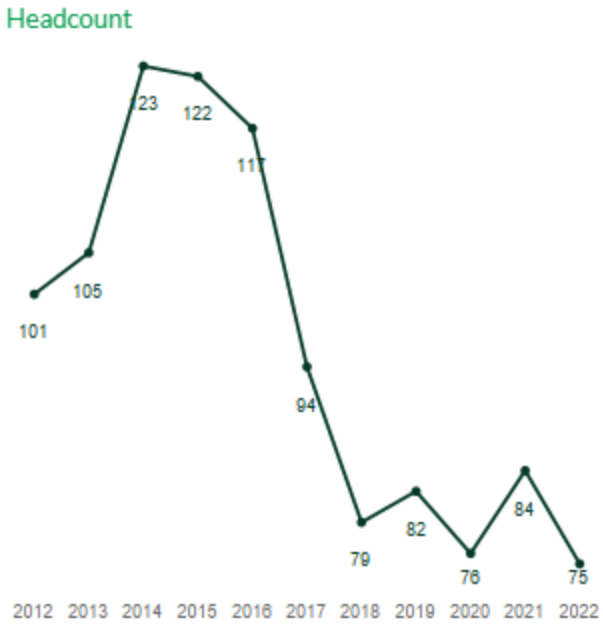

Figure 6. EEE Graduate program student headcount: 2012 - 2022

Likewise, the 10 –year average term GPA is shown below in Figure 7. Student performance, as measured by overall GPA, has kept well above 3.0, except during 2016-2017 period. This trend shows that most students maintained "In Good Standing" status throughout their academic tenure in the graduate program.

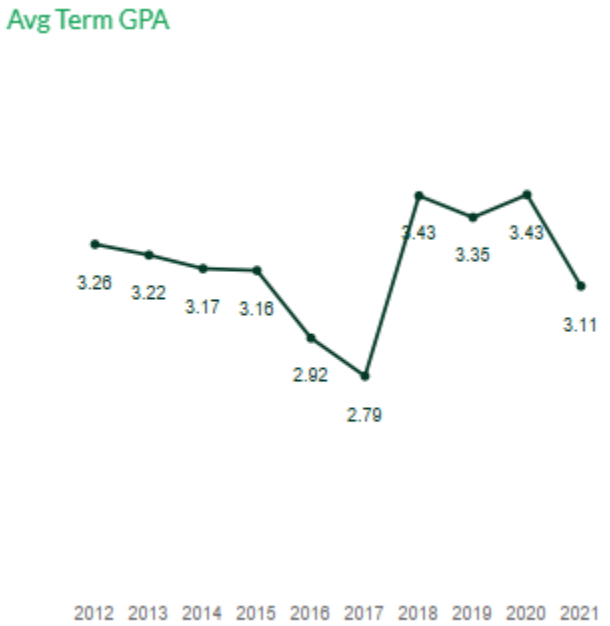

Figure 7. EEE Graduate program average student GPA: 2012 – 2022

C. Graduation Data for the Past Six Years Disaggregated by Gender and Ethnicity

General graduation data for the EEE M.S. program for the AY 2015-2021 is shown in Table 12 and a typical view of ethnicity and gender distribution of EEE department graduation numbers (only available for overall B.S and M.S. programs) for the 2020-2021 year is shown in Figure 8.

Year	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Students graduated	37	60	37	35	23	19

Table 12. Graduation data 2015-2021

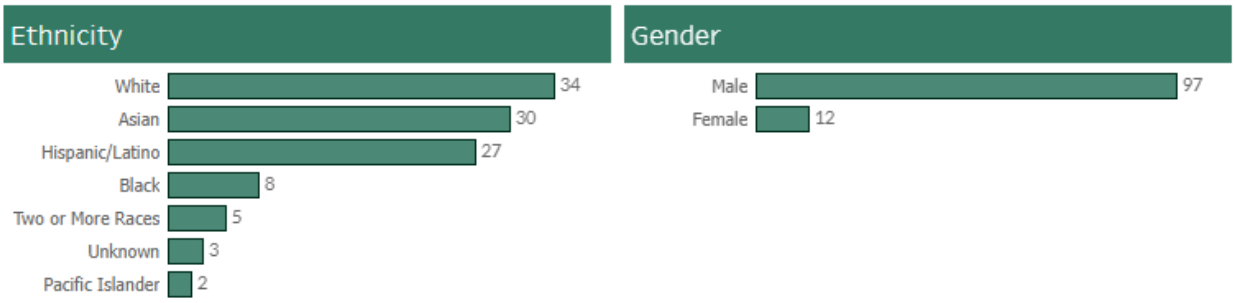

Figure 8. EEE graduation (BS + MS programs) gender and ethnicity data for 2020-21

D. Analysis on Admission, Retention, and Graduation Data, Including How to Maintain Success and Improve Time to Degree, and Consider Concentrations as Needed.

As seen from Table 11 above, application and admission numbers to the EEE Graduate Program have declined steadily during the 2015-2021 period. The admission was at a minimum during the 2020 pandemic year with significantly reduced international student admission, primarily due to closure of U.S. consular visa offices around the world. It is encouraging that admission has picked up in 2021 and hopefully this trend will be maintained. Correspondingly, the number of students graduated has also followed the steady downward trend, as shown in Table 12.

The EEE department has also discussed other probable causes for the overall decrease in EEE graduate applications to the EEE graduate program over the years and ways to increase enrollment. Global economic factors have primarily contributed to the decrease in international student applications. These factors and proposed solutions for the future are elaborated in Elements Four and Five of this report.

E. Summary of Current Partnerships in Success Efforts

E.1. Orientation

At the time that graduate students join Sacramento State, they are required to attend two orientations: an initial University orientation organized by Office of Graduate Studies (OGS)/International Programs, followed by the EEE Department orientation. At the university orientation, students receive campus tours, information about student services, standard procedures, etc.

Due to the COVID-19 restrictions, orientation for the Fall 20, Spring 21 and Fall 21 semesters was virtual (but fun and interactive). As with other programs, students majoring in Electrical and Electronic Engineering attend a group advising session as a part of the department orientation. The session includes specific information on curriculum patterns and individualized advice on the selection of classes. Department procedures are also explained.

E.2. Regular Advising

Students are required to seek regular advising at least once per year. For this advising, students are required to meet with one faculty member of their choice, who serves as the student's Faculty Adviser. Each student will make a list of courses in progress and courses planned for the next semester in advance of their advising meeting and then focus their studies in one or more of the following areas, Control Systems, Communication Systems, Power Systems, Microelectronic Design, or Computer Architecture & Digital Design.

The EEE Graduate Coordinator conducts weekly advising sessions, to assist new and ongoing graduate students with planned graduation date and the graduation application process. All regular advising sessions will make use of the student's "My Sac State" advising center so that all official records are readily available. In addition, handouts are available on the Department website and on hardcopy that show prerequisite relationships and describe suggested plans of study.

E.3. Mentoring

The EEE faculty members teach graduate courses and advise graduate students. Many graduate students choose to work on a research project or thesis for their culminating experience. One of the responsibilities of the faculty is to assist and provide advising to graduate students in their research projects. Several MS projects have resulted in joint faculty-student publications and patents. EEE graduate students also have the option to work in groups (maximum of 2 students) on joint projects/theses.

E.4. Student Organizations and Clubs Advising

Student branches of professional organizations such as the IEEE and student clubs operating on campus are required to have a faculty advisor. The EEE faculty members serve in this capacity when needed. The faculty advisor for the IEEE student branch is Prof. Meduri, and Prof. Zarghami serves as the advisor for the IEEE PES (Power and Energy Society) student branch. During the 2021-2022 academic year, The IEEE Sacramento Valley Section hosted six internationally pre-eminent scholars to present their state-of the-art findings in areas ranging from communications, power, AI, and others to EEE students and faculty.

E.5. Career and Professional Advising

The College of Engineering and Computer Science has a Career Center available to all its students that helps them with non-academic advising such as the preparation of resumes, professional development classes, internships, etc.

E.6. Office of Graduate Studies Writing Workshop

Sacramento State's Protected Writing Time is a series of workshops designed to help students with the writing progress leading to the completion of a prospectus, thesis, project, dissertation, or other academic writing/professional development. There is no cost, units, or grading for this workshop. Workshops include group meetings, individual accountability measures, and at least three hours of writing each session. All sessions are held on an online platform via Canvas.

E.7. Partnership with Local Industry

With the help of the college of Engineering and Computer Science Career Center, the EEE department assessment committee organizes industry site visits to companies that hire EEE program graduates. In the current cycle, the department performed three site visits. During the visits, a focus group from the EEE department meets with the program alumni and managers (who are not necessarily our alumni) at the company. In addition to questionnaires, the focus group interviews the alumni and managers. Valuable feedback is obtained through this process. The department's focus group visited the following companies in the current accreditation cycle:

- Micron, located in Folsom, CA
- Tesco, located in Sacramento, CA
- SMUD (Sacramento Municipal Utility District), Sacramento, CA.

The results and feedback obtained during the visits are combined and studied to identify the program strengths and required improvements.

In conclusion, through teaching, research, office hours, advising, mentorship, research, and connecting students with different college and university offices such as the ECS Career Center, the EEE faculty interacts with the students in the graduate program on a regular basis, which builds stronger links and provides better understanding between faculty and students, helping to close the gap and identify ways to improve the attainment of the student outcomes.

Element Four: Developing Resources to Ensure Sustainability

A. Key Strategic Initiatives for the Academic Unit

Community engagement has always been an area of commitment for the EEE faculty, where a sense of belonging to the community has resulted in career satisfaction in many of them as history shows. In his 2018 Fall address, Sacramento State President Robert S. Nelson has outlined a vision to deepen and strengthen the University's engagement with the community by transforming the campus to an "anchor university". Based on the President's words:
"An anchor university is the opposite of the Ivory Tower. It aims to connect its students, faculty, and staff with the community, and, in turn, help build and heal that community, achieving lasting solutions and improvements through inclusive civic engagement".

The anchor university initiative can potentially result in improving faculty retention and satisfaction. More about anchor university can be found here. EEE department has worked on multi-dimensional efforts to ensure our efforts are harmonious with the anchor university initiatives. Following are some of the major highlights in this regard:

- The EEE department provides workforce for many local and northern California companies directly related to the different areas of electrical and electronic engineering. To name a few, Intel, Tesco, HP, Micron, US Navy and Army, Skyworks, Akron Microwaves, Jampro, Tyco Electronics, California Department of Water Resources, California Energy Commission, SMUD, PG&E, and CAISO continue to steadily hire our students.
- Through Senior Project and Graduate Student showcases, our faculty and students have demonstrated their commitment and willingness to solve problems of the community and our society. We have invited local industry professionals as part of our Industry Liaison Committees to increase bilateral relationship between our department and regional industries. These activities have undoubtedly helped our students in pursuing their future careers.
- Our faculty have been engaged in activities with local and regional institutions, universities, and companies for the benefit of our society. To name a few, we have had partnerships with the Shriners hospital, SMUD, PG&E, California Energy Commission, etc. These include areas such as biomedical research and electric energy.

We expect our new faculty hires to be active in community engagement and to pursue opportunities to connect with other colleges/programs and/or University/College/Dept initiatives such as College of Continuing Education, Carlsen Center for Innovation & Entrepreneurship, CA Mobility Center, Promise Zone, Placer Campus, and the greater campus community. Another area to be positively considered in the profile of our candidates is their willingness to outreach local K-12 schools and motivating underrepresented students (e.g., girls) towards STEM fields.

A.1. MS in Power Engineering

Currently, the EEE Department offers a number of power engineering courses as part of a curriculum track within its Master of Science in Electrical and Electronic Engineering. Although these course offerings have positioned the College of Engineering and Computer Science (ECS), as one of the leading employer destinations in the state of California for power engineering

talent, ECS is unable to sufficiently satisfy employers' growing demand for power engineering talent.

Therefore, the faculty of the Department of Electrical and Electronic Engineering (EEE) are seeking to create a comprehensive program to fill the unmet need for more workforce talent in the area of power engineering in the state of California. The proposed MS in Power Engineering program has been approved in the Academic Master Plan of the CSU system through the Chancellor with an originally approved implementation year of 2019. Due to the COVID-19 pandemic, implementation of the program has been delayed but is still under the track of our faculty.

A.2. Student Success Committee

Student success is achieved through constant revision of the curriculum and improved assessment methods. Our EEE Student Success Committee is actively working on new strategies to improve graduation rates through proper advising and engagement of students. We have identified key pedagogical bottlenecks in critical courses to reduce D/F/W rates. We are committed to active use of advising tools such as EAB (formerly Education Advisory Board) for proper documentation of our meetings with students.

We also encourage our new faculty hires to be actively involved in efforts directly related to student success, such as student advising and mentorship. We are committed to proper training of our new hires in the areas related to student success, and carefully assess our new hires' commitment and service towards student success before recommending tenure and promotion.

A.3. Antiracism, Inclusion, and Diversity

We believe that diversity of our faculty has been a key element in the overall success of the EEE Department. Our faculty members come from diverse genders and backgrounds and we welcome candidates who can make our demographics even more diverse and colorful. We believe that diversity will bring a sense of belonging and inclusion among the body of our faculty, staff, and students. As a Hispanic serving institution, we think that it is crucial to promote anti-racism and inclusion in our department. Our students have proved through senior design courses and other similar platforms that they can work together in a colorful group of people and can deliver high quality work without being impacted by racial stereotypes.

Women are still a minority in many of the science and engineering fields. Hence, we work hard to include women in these fields. In many of the classes in our department, sexual minorities stay quiet the entire semester although their written exams prove that they have very high capacities. Hiring sexual minorities will provide the greatest role model to those quiet students and provide them with more self-confidence as they need to enter the workforce. In our hiring advertisement, we will encourage women and underrepresented groups such as African Americans and Hispanics to apply. During our faculty screening process, candidates' prior demonstration of commitment to the values of inclusion, diversity, and antiracism, as well as their willingness to participate in university-initiated divisions such as the Division of Inclusive Excellence will be highly considered.

B. Hiring Needs for the Academic Unit, and Multi-Year Faculty and Staff Hiring Plan

As of Fall 2022, the EEE Department has a total of 15 full-time faculty (13 tenured/tenure track; 2 lecturers). However, three of the tenured faculty are in the FERP (Faculty Early Retirement Program); hence, hiring new faculty is always a high priority for our department. Part-time faculty are also a very valuable resource for our department; In Fall 2022, for example, 57 course sections of a total of 148 course sections were taught by part-time faculty members.

B.1. Staffing

The EEE undergraduate and graduate programs are supported by one administrative support coordinator (ASC) who is responsible for departmental activities including answering phone, electronic and drop in inquiries; maintaining student files; entering schedules into the registration system; travel and purchase requests; hiring student assistants; and departmental correspondence.

The department ASC also devotes some time to support the CpE program. In addition, a full-time administrative support assistant (ASA) works under supervision of the ASC to fulfill departmental tasks. The department office staff typically also includes two part-time student assistants. The department also has one full-time equipment technician for the maintenance of hardware including laboratory test equipment. With the existing number of students in the EEE program, the current number of staff seems adequate.

B.2. Faculty Hiring

The ECS College provides each new hire with a start-up package which includes release time, professional development funds, and summer salary. Additionally, the EEE department is committed to providing part of its budget for the faculty's professional development purposes, such as society memberships and conference participation. In the last 2 years, we have lost 5 full-time faculty members. We currently have only one tenured/tenure-track faculty in the Electronics area, which is one of the 4 critical areas in EEE, and has been one of the most favorable areas to our students due to close proximity of multiple related industries/companies in our region and its good job market.

In the EEE department, more than 50% the courses offered for the BS and MS CpE programs are taught by the EEE faculty. EEE faculty are responsible for the capstone courses (CpE 190/191) in the BS CpE program. Percentage of WTU taught by tenured/tenure-track faculty in four subsequent semesters of Fall 2019, Spring 2020, Fall 2020, and Spring 2021 have been 51, 46, 43, and 39 respectively, which shows a steady decrease possibly due to more recent hires in the CSc department.

Faculty reduction has caused visible impacts on curriculum or graduation rates. EEE/CpE 64, EEE 174, EEE 180, ENGR 1, EEE 193A, EEE 193B, CpE 190, and CpE 191 are required courses, some with laboratory components, which are offered every semester. The loss of faculty will make it difficult to offer multiple sections with fewer tenure-track faculty; besides the impact on offering electives and graduate courses, and support of teaching and curriculum development and advising. The graduate program is also affected by the lack of sufficient faculty due to reduced number of advisers for M.S. projects and theses. The Comprehensive exam option offers a limited solution to the latter issue; however, significant faculty effort is also required for the preparation and conduct of the exam.

The EEE Department was approved to hire a tenure-track faculty in the mixed-signal electronics area in 2019; however, due to the COVID-19 pandemic, the search was cancelled in 2020. In

2021, another full-time tenure-track faculty position was approved for our department by the university. Due to the sudden leave of the only full-time tenured faculty member in the Controls area, it was decided by the department to dedicate the position to the Controls area. The department has successfully hired a new faculty member, Dr. Rohollah Moghadam, for this position which started in Fall 2022. Additionally, in 2022, two tenure-track faculty positions have been approved for our department, which have been dedicated to the mixed-signal electronics and digital electronics areas. The faculty search for these two positions is currently underway with an expected starting date of Fall 2023.

B.3. Plan and Process for Faculty Hiring

Departments submit an annual faculty hiring plan to the ECS college Dean, and these are compiled and submitted to the university Provost for approval. Once the positions have been approved, the department starts the recruitment process. All vacancy announcements, selection criteria, reference-check questions and interview questions are reviewed and approved by the department screening (hiring) committee, the ECS Dean and the campus human resources administrator.

A faculty search is then initiated, advertisements are posted, and the applicant pool is reviewed by the Dean to determine its adequacy. Subsequently, a list of candidates for reference-check is submitted to the Dean for approval. Finalists are then identified by the committee and invited to campus for interviews. Once the interviews for a position have been completed, the committee establishes a list of candidates to be submitted to the department at large. The department faculty members who have attended scheduled events for all the candidates for a given faculty position then vote on a ranking of the candidates to be offered the position. The ranking is then recommended to the Dean.

B.4. Strategies for Faculty Retention

The department has a long history of being a place where faculty members spend most of their academic career. Many recent retirees have served since the eighties. There are several factors that contribute to faculty longevity in the department:

- The department has a collegial atmosphere.
- Research opportunities exist for the faculty, and teaching performance is highly regarded.
- Sabbaticals and difference-in-pay leave programs make time available every six years.
- Salaries and benefit packages are competitive. The Public Employees Retirement System, CalPERS, is viewed by many as one of the best pension systems in the country.
- On-campus grants for research and creative activities and for pedagogy enhancement are available.
- The campus is located geographically close to Silicon Valley, San Francisco, and is in the state capital of California.
- Opportunities for industry collaboration abound. Local companies include Agilent, Hewlett-Packard, and Intel; as well as governmental agencies such as the California Department of Water Resources (DWR), California Energy Commission, and the Defense Microelectronics Activity (DMEA). Sacramento houses the headquarters of most of the agencies of the State of California (e.g., Caltrans). It also houses CAISO (California Independent System Operator), SMUD (Sacramento Municipal Utility District), and several offices of PG&E (Pacific Gas and Electric).

C. Summary of Major Budget Concerns (Facilities, Equipment, Student Assistants, etc.).

C.1. Budget Process

At the university level, the annual general fund or baseline budget for the College of ECS is determined each year by the Provost based on the budget of the previous year with additions or deletions associated with increases or decreases based on estimates of needs and costs by Academic Affairs. The General Fund budget categories are faculty, department chairs, management and staff, operating expense, and equipment. In addition, the college and each department have a general trust fund which is funded by gifts and donations that are used to support needs of the programs, supplemental to the general fund budget.

Each year the college budget is primarily divided across the departments based on the cost for faculty and staff salaries and cost for operation of the program. It is based on the budget of the previous year with increase or decrease depending on changes in needs. Departments may receive additional funds for one-time operation costs.

General (Operating) Budget for the department in the past two academic years has been $52,353 for Fiscal Year 20/21 and $59,747 for Fiscal Year 21/22. In addition, through the College of Continuing Education (CCE), the department has also secured supplemental budget by offering summer session courses, averaging over $18K in the past two years.

C.2. Support for Teaching

The college allocates funds for student graders and tutors for each program. Tutors are also provided through the university Faculty Student Mentor Program. In addition, the university offers teaching support services for faculty through the Center for Teaching and Learning.

C.3. Infrastructure, Facilities, and Equipment Funding

In addition to the Operating and Supplemental budgets listed above, a separate college Equipment replenishment Fund has traditionally been allocated annually by the Provost using end- of-the-year appropriations (see Table 13).

Academic Year	College Allocation	Department Allocation
2014-2015	$164,011	$16,100
2015-2016	$250,000	$16,100
2016-2017	$500,000	$46,246
2017-2018	$300,000	$34,777
2018-2019	$300,000	$34,777
2019-2020	$300,000	$47,486

Table 13. Five Year College and Department Equipment (replenishment) Funding.

The College of ECS maintains an IT support staff (Computing, Communications and Academic Technology Services) and a technician shop in support of facilities and equipment within the overall baseline budget allocation. CCATS (Computing, Communications and Academic Technology Services) maintains all shared college computer facilities, maintains all departmental faculty computers, and provides software support to the departments of the College. The

Department of Electrical and Electronic Engineering has one support technician for the maintenance of hardware including laboratory test equipment.

Major uses of the department allocation have been software maintenance fees, laboratory equipment, instructional support equipment, facilities improvements, and equipment in support of the department technician (supplies and tools). In the current cycle, there has been an overall increase in the department allocation since AY 2017/18. In 2019, with direct support from the university and college, the Power Engineering laboratory has obtained state of the art educational equipment in electric machines. In this area we will be obtaining more equipment with the help of university and the college.

At the campus level, the Informational Resources and Technology (IRT) division provides central support for campus level laboratories and IT needs.

C.4. Adequacy of Resources to Attain Student Outcomes

As stated previously, most of the program budget is derived from the allocation from the College of Engineering and Computer Science, which receives its budget from the university and which in turn receives funding from the state. The historic level of support has allowed the department to maintain high quality programs. State budget is of course closely tied to the economic health of the state.

After the start of the COVID-19 pandemic there have been mandatory budget cuts to help in the continuation of the university and its programs. Due to these cuts, faculty and staff hiring has also been affected. For example, the department was not able hire an Assistant Professor position in AY 2019-2020 even though the position had been approved in the prior academic year. More recently, the university has allocated a one-time HEERF fund (Higher Education Emergency Relief Fund) to be used for obtaining critical resources such as equipment.

D. Revenue Opportunities (Grants, Gifts, Partnerships, etc.).

D.1. Gifts and Grants

Due to the growing needs of the industry in the power and green energy areas, the EEE department has received two major grants (first two in list below), totaling around $1.1 Million:

- Federal Appropriation Gift in the amount of $575K in Fall 2022 for lab equipment purchase.
- Donation from SMUD (Sacramento Municipal Utility District) in the amount of $600K in Fall 22 to be spent on lab equipment and curriculum development in the power area. SMUD has signed an agreement with CSUS to provide financial support for the above-mentioned activities.
- Microwave Lab has also received RF equipment donation worth $40,000 from Keysight technology in 2018.
- Intel also donated 30 DE-10 Nano FPGA boards for use in graduate and undergraduate Digital Design courses. In-kind donation from ARM (leading microprocessor designer) company for software licenses totaled around $110K of market value.
- Prof. Warren Smith has received a research grant from Shriners Children's Northern California hospital in Sacramento in the amount of $200,000 for two years to develop

wearable monitors to log tripping in children during everyday living, to start in January 2023.

The faculty also pursued multiple intramural and external federal grants to enhance pedagogy, research and update labs, currently pending approval for over $1 Million.

D.2. Partnerships and Outreach

The EEE department is involved in several outreach efforts, primarily to share electrical technology that would benefit people in Sacramento and surrounding regions. Some examples are given below:

D.2.1 Collaboration with SMUD

The EEE department has worked on a multi-dimensional proposal with SMUD to address concerns in the areas of laboratory usage and furnishing. Renewing power engineering laboratory has followed objectives such as:

- Providing a safe and modular laboratory space to be used in research and creative activities
- Providing educational scale equipment to provide knowledge in emerging concepts in power engineering such as renewable energy integration and micro-grid applications
- Implementation of cyber security platforms in micro-grid that was impossible to do with legacy devices in the lab.
- Developing the future of power engineering at CSUS by working on initiatives such as resource expansion in lab in form of associates and post-doctoral fellows.
- Students' leadership and involvement in different venues through mutual training sessions and internship
- Curriculum revitalization through understanding real power engineering challenges

D.2.2 Outreach to the Medical Community

Since 2017, the EEE Department has been involved in an outreach effort to the veterinary community, and more recently, the medical community, by providing Radio Frequency (RF) technology for the treatment of cancer. Specifically, RF therapy warms tumors and provides much needed palliative relief for the patients, and tumor shrinkage in some cases. During the past 5 years, this outreach has benefited medical and veterinary patients in the Sacramento/Bay area regions, in Arizona and in Idaho. This community effort actively involves undergraduate and graduate students and has resulted in several M.S. project reports and presentations at the CSU Annual Biotechnology Conference.

This outreach effort also serves as a source of revenue to the EEE Department, by means of renting of Radio Frequency (RF) equipment to the medical and veterinary clinics. This equipment is used by the clinics to provide RF therapy to cancer patients, for which training and technical support is also provided by our department.

D.2.3 DMEA Educational Partnership

For over 20 years the EEE Department has had an Educational Partnership Agreement (EPA) with the Defense Microelectronics Activity (DMEA) at McClellan Park in Sacramento. This has proven to be a mutually beneficial agreement for both parties. DMEA has benefited by hiring many of our students who get a BS in EEE degree, and by sending them back to Sac State to get an MS in EEE degree, specializing in analog and mixed-signal integrated circuit (IC) design. The specialized knowledge their engineers gain is critically important to the success of their work

designing mixed-signal integrated circuits. In fact, the current Director of DMEA, Nick Martin, got his EEE MS degree studying mixed-signal IC design at Sac State.

This close relationship has also greatly benefitted the EEE Department and our students. For example, DMEA has donated a substantial amount of equipment to EEE over the years. They have also sponsored cooperative research projects focusing on new mixed-signal IC designs, by providing both expert advice and silicon fabrication services in advanced CMOS processes at no cost to EEE. The most recent example of this was the design of a new type of level-crossing Analog-to-Digital Converter (ADC) in 90nm CMOS that a team of our EEE MS students designed in AY2019-20. This type of hands-on, practical experience designing real world integrated circuits is invaluable for our students and would not have been possible without the support of DMEA.

Element Five: Summary of Areas of Concern and Means of Improving

In this section, we detail the insights gleaned during the Self-Study process, with reflections on how to help improve the quality of the graduate program in the EEE department. Main concerns identified during the course of self-study are listed below:

1. How will the department increase the number of faculty members?
2. How can the department improve the enrolment numbers?
3. How can the course offerings in EEE MS program be made flexible?
4. How can the quality of research be enhanced?
5. How can the assessment process be improved for next review cycle?

The following actions are currently underway and will continue to address the department's concerns.

A. Sustainable Growth in Faculty Numbers

The EEE Department plans to hire new faculty members on a continuous basis. The EEE department is in the process of hiring two tenure-track assistant professors, starting in Fall 2023 and continues to negotiate with the Dean and the Provost for more hires in upcoming academic years based on the department needs in strategic areas.

B. Improving Enrollment Numbers

The EEE department is planning to improve the number of enrollments by developing a new online MS program and also introduce an accelerated BS-MS degree. This effort for online degrees is aligned with the University's 2020 and 2022 – 2027 Strategic Plan Framework.

Through an international program between CSUS and Chongqing University from China during 2013-2017, groups of master's students at Chongqing University would spend a year (two semesters) at CSUS to complete part of their coursework as well as their culminating experience. The program resulted in numerous successful collaborations between the faculty members in the two universities and was very well received by the students. However, due to logistical issues in execution, and despite faculty members' willingness to continue the program on both sides, it was decided by the university administration to discontinue the program. More recently, our faculty members are exploring ways to revive similar programs through the IPGE (International Programs & Global Engagement) Office.

C. Hybrid MS Program for Power Engineering

Currently, the EEE Department offers a number of power engineering courses as part of a curriculum track within its MS in EEE. Although these course offerings have positioned the College of ECS as one of the leading employer destinations in the state of California for Power Engineering talent, it is unable to sufficiently satisfy the employers' growing demand for power Engineering talent.

Therefore, the faculty of the EEE Department are seeking to create a comprehensive program to fill the unmet need for more workforce talent in the area of power engineering in the state of California. The planned MS in Power Engineering program has been approved in the Academic Master Plan of the CSU system with an originally approved implementation year of 2019. Due to

COVID-19 Pandemic, implementation of the program has been delayed but is currently being developed by our faculty.

D. Accelerated BS-MS Program Currently under Preliminary Discussion

The accelerated BS-MS programs have been extensively developed in many universities such as Colorado State University as Accelerated Master's Program (AMP). This creates an opportunity for undergraduate students to enroll in a graduate degree program and receive an MS degree in less time and at a significant cost saving. In this program, students take some graduate courses in their bachelor's degree, while paying the undergraduate tuition, that will double count in their MS degree. Discussions are currently underway with all stakeholders to develop an accelerated BS-MS degree in all main graduate areas. This will increase graduate student enrollment and improve the quality of the MS program in Sac State.

E. Improving the Quality of Research

As mentioned in Element Four D.1, the power engineering group in EEE department has received funding from different agencies such as federal and local industries. The group has a plan to upgrade the lab equipment not only for the undergraduate program but for enhancing the quality of research in graduate program. For example, the group is working on cross-departmental collaborations in the area of cyber security applied in the power engineering, which is getting more attention due to the attacks on the critical infrastructures, in the lab activities for research purposes.

Moreover, the faculty members in the EEE department are developing courses related to the current research subjects such as machine learning with applications to power engineering, control systems and robotics. These newly developed courses will integrate faculty's ongoing research into graduate level coursework and the addition of new faculty opens new opportunities for collaborating in this novel area. This incorporates high-quality research into EEE curriculum through new coursework, mentored MS projects and Theses work.

The EEE department has a great collaboration with local industries and is nurturing contacts from its Industry Liaison Council members to organize invited talk sessions from industry guests. This will enable the research and development teams of the industry to share their needs and current challenges with graduate students and find areas of meaningful research collaborations. This will help students to work on projects that are aligned with the industry related research areas and, eventually, graduate with career ready skills.

F. Adjustment/Revision to the Current Assessment Plan

In addition to the above-mentioned strategic initiatives to address concerns identified during the self-review process, the EEE department also intends to revise its graduate program assessment strategy. Particularly, the PLOs 4 – 6 listed above are currently measured in EEE 201 and EEE 500 courses (see table 10). While this provides valuable insights, expanding the assessment of these PLOs based on data from other courses will provide a more comprehensive picture of how student learning improves during the course of their study in EEE graduate program. In order to modify the assessment plan, the EEE department will coordinate with the Office of Graduate Studies, the Office of Academic Programs and Assessment and other departmental stakeholders.

Appendix B. External Review Report Sample Template

Academic Unit Name: Electrical and Electronics Engineering

Degrees: Masters

Site Visit Dates: March 6, 2023

STAGE	DESCRIPTION
Initial	The program is at a preliminary stage in this practice. The program shows the need for additional policies, resources, or practices in order for it to provide the education program to which it is committed or aspires. Insufficient data is available to make determinations.
Emerging	The program partially satisfies the criterion. Some data is available documenting this dimension. The program has many, but not all, of the policies, practices, and resources it needs to provide the educational program to which it is committed or aspires.
Developed	The program satisfies this criterion, with developed policies and practices. The program has the availability of sufficient resources to accomplish its program goals on this dimension. Data demonstrates accomplishment of this criterion.
Highly Developed	The program fully satisfies this criterion. The program may serve as a model and reference for others on campus. The program's practices, policies, and/or its resources contribute to program excellence on this dimension.

ELEMENT ONE: ACADEMIC UNIT'S MISSION AND INSTITUTIONAL CONTEXT	
INQUIRY	**STAGE**
Does the academic unit have a mission statement or statement of program goals that is appropriate?	D
Are the academic unit's mission and its programs aligned with CSUS and college missions and strategic priorities?	D
Is the academic unit supportive of the CSUS general education program and/or general graduate learning outcomes?	D
Does the academic unit engage key constituencies and campus partners in academic and strategic planning, including faculty, professional colleagues, current and prospective students, and the community?	D
Does the program have policies and procedures that facilitate articulation with community colleges and/or other external educational partners?	NA
Comments: See attached	
Recommendations: See attached	

ELEMENT TWO: LEARNING OUTCOMES AND ASSESSMENT TO MAINTAIN SUCCESS AND ENGAGE IN CONTINUOUS IMPROVEMENT INQUIRY	STAGE
Does each degree program have appropriate and measurable learning outcomes that reflect current standards in the discipline?	D
Does each course have appropriate and measurable learning outcomes that allow students to achieve program learning outcomes?	D
Are the curriculum and graduation requirements for each degree reflective of current standards in the discipline?	D
Are each degree's curriculum and graduation requirements appropriate for the degree level and do they reflect high expectations of students?	D
Is the assessment loop regularly being closed for each of the degree's program learning outcomes?	D
Is the learning assessment data being used to, per the Element Two heading, maintain success and engage in continuous improvement?	D
Do students feel connected to academic support services (writing, math, tutoring, library, etc.)?	D
Comments: See attached	
Recommendations: See attached	

ELEMENT THREE: STUDENT SUCCESS AND ASSESSMENT TO MAINTAIN SUCCESS AND ENGAGE IN CONTINUOUS IMPROVEMENT INQUIRY	STAGE
Does each degree program use aggregated and disaggregated data to understand admission trends and to manage enrollment with an eye to diversity and impaction, or to address program-specific concerns?	E
Does each degree program use aggregated and disaggregated data to consider ways to improve retention?	E
Does each degree program use aggregated and disaggregated data to consider ways to improve time to degree or to close graduation gaps?	D
Does the program provide appropriate opportunities for students to participate in curricular-related activities, such as research and creative opportunities, service learning experiences, performances, and internships?	D
Does the program provide or partner with other entities to provide appropriate co-curricular activities for its students, such as clubs, field trips, lectures, and professional experiences?	HD
Does the program provide adequate student advising?	HD
Do students feel connected to student success support services?	HD
Comments: See attached	
Recommendations: See attached	

ELEMENT FOUR: DEVELOPING RESOURCES TO ENSURE SUSTAINABILITY	
INQUIRY	**STAGE**
Does the program have faculty in sufficient numbers and with appropriate rank, qualification, and diversity to allow students to meet the program learning outcomes and deliver the curriculum for each degree program?	D
Does the program employ professional staff and/or appropriately partner with campus partners (e.g., graduate studies or College of Continuing Education) to support each degree program?	D
Are the program's facilities, including offices, labs, and practice and performance spaces, adequate to support the program?	D
Does the program have access to information resources, technology, and expertise sufficient to deliver its academic offerings and advance the scholarship of its faculty?	D
Does the program seek and receive extramural support at the appropriate level, including grants, gifts, contracts, and alumni funding?	D
Has the program identified other concerns that impact budget and resource planning?	D
Comments: See attached	
Recommendations: See attached	

ELEMENT FIVE: PLANNING TO MAINTAIN SUCCESS AND ENGAGE IN CONTINUOUS IMPROVEMENT	
INQUIRY	**STAGE**
Does the academic unit engage in planning activities which identify its academic priorities and their alignment with those of the college and the university?	D
If appropriate, does the program have an advisory board or other links to community members and professionals? Does the program use community professional input for program improvement? Does the program maintain a relationship with its alumni?	HD
Does the academic unit have a strategic plan, and other long term plans (5-year hiring, facilities, etc.)?	D
Does the academic unit have regular processes to revise plans and timelines?	E
Do plans include engagement with needed campus partnership and external entities to accomplish goals?	E
Comments: See attached	
Recommendations:	

Commendations: See attached

Recommendations and Specific Considerations to Improve Learning and Student Success For Each Degree:

Recommendations and Specific Considerations to Develop Resources to Ensure Sustainability:

Recommendations and Specific Considerations to Improve Academic Unit Planning:

External Reviewer One Name: S. K. Ramesh Affiliation: California State University, Northridge

Signature: _____

External Reviewer Two Name: Kathleen Meehan Affiliation: California State University, Chico

Signature: _____

Comments, Commendations and Recommendations for the Masters degree program in Electrical & Electronic Engineering

The EEE Masters degree Program has faculty supporting the areas of specialization including Control System, Communication Systems, Power Systems, Microelectronic Design, and Computer Architecture & Digital Design. The program requires a 10 unit core including mandatory courses in Research methodology and EE Computational methods, besides two core courses from the areas of specialization. The department is awaiting approval and poised to offer a hybrid MS in Power Engineering program that has tremendous potential for the region and the nation. Additionally, the department has an acclaimed certificate program in Mixed Signal design which could be leveraged to strengthen the current graduate program by exploring options such as stackable certificates. The department offers industry relevant curricula in these areas, preparing graduates from the program to serve in a variety of positions.

The department has a thorough assessment plan that maps Program Learning Outcomes matched with University Level Goals, regularly assesses course level outcomes, and uses the information to make changes and close the loop for program improvement. Assessment of the PLOs at the program level is carried out by using a variety of indirect assessment tools:

• Graduate student and alumni surveys reflecting on program outcomes.

• Site visits to industry.

• Independent assessment by Department-level Industry Representatives.

• Feedback from College's Industry Advisory Board.

• Employability statistics of our graduate students.

Students in the program are overwhelmingly positive about the program, the faculty, and their experiences, and the opportunity to work on hands on projects that effectively prepare them for careers in industry. Students in the program have completed several innovative design projects with real world applications.

Faculty Research: The department has hired several outstanding new tenure-track faculty in the last 3 years and is working hard to enable their success in the classroom and with their research. Support in the form of release time (6 units/year) for two years is common for all new faculty. Additionally the college and the university have several mechanisms in place to provide release time to support faculty research. Also there is the potential to connect graduate students interested in pursuing the PhD with suitable doctoral programs in the region.

As of Fall 2022, the EEE Department has a total of 15 full-time faculty (13 tenured/tenure track; 2 lecturers). However, three of the tenured faculty are in the FERP (Faculty Early Retirement Program); hence, hiring new faculty is always a high priority for our department.

Recommendations:

1. Develop a plan to diversify the student body with strategies to incentivize and recruit resident students including graduates from the BS degree programs in Computer Engineering, and EEE.

The department is exploring a combined BS+MS degree program as one of the options to attract resident students and strengthen enrollment. Faculty in the program have developed effective instructional pedagogies that enable the delivery of the program in diverse formats including hybrid, fully online and face-to-face. The program has an opportunity to grow significantly by focusing on the needs of the students it seeks to attract and adapting the modalities to serve them effectively.

2. Use the proposed new hybrid MS in Power Engineering program to strengthen collaboration with industry.

The self-study report indicates that there is unmet industry demand for graduates in this area. The department recognizes this and is hiring with intentionality to build on its rich legacy of Power Engineering Education. The new MS in Power Engineering program has the potential to attract students, strengthen enrollment, and improve visibility for the MS in Electrical and Electronics Engineering degree program.

3. **Reduce current set of PLO's from six to four.**

The department has done a commendable job in attracting industry practitioners to the classroom. The department needs to review the PLO's for consolidation with the goal of reducing the assessment workload burden on the faculty. This is especially critical as the self-study report noted that 57 % of the courses are taught by qualified part-time faculty members.

3. Consider assessing events such as the annual showcase where students present their work via posters and presentations to the public and industry to help students improve their oral and written communication skills

4. Promote the certificate program in Mixed Signal design to strengthen the graduate program.

This is an area of great industry demand and the department has already established a strong reputation through its current offerings. The certificate offers tremendous visibility and is a way to attract potential new students to the MS in EEE program.

6. A 3-5 year hiring plan to recruit new tenure track faculty and replace retiring faculty.

Two tenure-track hires are planned in the current hiring cycle and the department expects to hire additional faculty in the coming years to replace retiring faculty. A 3-year faculty hiring plan that is built on the department's growing areas of interest such as Power Engineering and Mixed Signal Circuit Design will be very beneficial.

Internal Review Report

Internal Review Report:	Electrical & Electronic Engineering
College:	College of Engineering & Computer Science
Degree Programs:	**MS in Electrical & Electronic Engineering**
Internal Reviewers:	Ben Amata, Library Pooria Assadi, College of Business
Date Submitted:	June 13, 2023

I. Context:

The Department Electrical & Electronic Engineering submitted a 33-page Self-Study in December, 2022 that conformed structurally to the Self-Study requirements in the *Academic Program Review Guide* (referred to as the *Guide*). It was timely, complete, and comprehensive but lacked sufficient self-reflection. ***The IRs overall recommendation is that all of the Department's faculty read the Civil Engineering Department's Self-Study for an example of an exceptionally well-done Self-Study with excellent self-reflection.***

External Reviewer Ramesh provided 5 commendations. 1) The Department has an acclaimed certificate program in Mixed Signal design. 2) The Department has a thorough assessment plan that maps Program Learning Outcomes matched with University Level Goals. 3) It regularly assesses course level outcomes. 4) It uses the information to make changes and close the loop for program improvement. 5) Its assessment of the PLOs at the program level is carried out by using a variety of indirect assessment tools. The IRs will respond to the 5 recommendations when appropriate in their report.

The External Reviewers (ERs) were Dr. S.K. Ramesh, Director of the AIMS program, College of Engineering and Computer Science, California State University Northridge and Dr. Kathleen Meehan, Chair, Department of Electrical Engineering, California State University, Chico.

According to the ER's schedule the March 6, 2023 via Zoom conformed to the *Guide's* requirements.

II. Recommendations:

Element 1. Mission and Context

The Department noted that it is planning to enhance the number of enrollments by "developing a new online MS program and also introduce an accelerated BS-MS degree" (Self-Study p 28) and "exploring ways to revive similar [international] programs through the IPGE (International Programs & Global Engagement) Office (Self-Study p 32)." This is an important consideration for the Department to maintain success going forward. At the same time, there is an opportunity for the Department to better specify the approach toward this goal, across application, admission, and retention dimensions. For instance, when it comes to admission trends, the Department noted (Self-Study p 21) that "it is

encouraging that admission has picked up in 2021 and hopefully this trend will be maintained." It would be helpful to discuss what reasons would support this hypothesis. For instance, the Department might reflect on whether this increased enrolment might be a short-term impact of pandemic-driven pent-up demand and assess any potential long-term implications.

In addition, the Department offered descriptive data on application, admission, and retention dimensions across race and ethnicity. While the IRs commend the Department for this initiative, the Department is encouraged to offer more analysis and discuss their plans to improve diversity in their recruitment efforts (i.e., expand on Self-Study Section D p 21).

The Department indicated that it is "involved in several outreach efforts, primarily to share electrical technology that would benefit people in Sacramento and surrounding regions." The IRs recommend that the Department takes advantage of these outreach efforts in the region in its recruitment efforts.

Together, these sorts of reflection would address one of ERs' recommendation (Comments, Commendations and Recommendations p 2) to "Develop a plan to diversify the student body with strategies to incentivize and recruit resident students including graduates from the BS degree programs in Computer Engineering, and EEE."

Recommendation R.1.1: The IRs recommend that the Department analyze and take advantage of potential student recruitment opportunities in their outreach efforts in the region.

Recommendation R.1.2: The IRs recommend that the Department include in its Self-Study a more analytical plan for enhancing the diversity of their student body.

Element 2. To Improve Student Learning (consider university/college goals on learning, research/scholarship, diversity)

The Department provided its SLOs, and that they are congruent with University's graduate PLOs. In Element Two, section B. Summary of Data for Each Learning Outcome, faculty reported the percentages of students who were able to meet the goals. They did not mention whether or not they used rubrics, or if there was a committee or a team that evaluated meeting their goals. They mentioned a Student Success Committee (Self-Study p 25) but didn't furnish sufficient details about its assessment work. Programmatic assessment isn't individual faculty evaluating individual direct measures (student work) for just their courses; it is sampling of student work evaluated using rubrics to standardize the assessment. For small programs, faculty can review all student's work if they think worthwhile. For example, they wrote (Self-Study p 8): "PLO1 (Apply core and advanced EEE knowledge and skills): Assessed in some of the elective core courses (from final exam), corresponding to the areas of specialization in our graduate degree program. Students are required to select at least two core areas of their choice within the program." Is there an unevenness in assessing core classes since not all students would take them? The purpose of programmatic assessment is to generalize about a typical student's learning, knowledge, and skills. They did say that they assess all students for the culminating experience (comprehensive examination) which is a valuable measure.

In section *C. Analysis for Each Learning Outcome* the faculty summarized student performance from the section above, *B. Summary of Data for Each Learning Outcome*, but missed the opportunity to reflect on it more deeply.

For PLO1 (core and advanced knowledge and skills), they stated (Self-Study p 11) "satisfactory performance rate in the elective core courses is generally around 70% or higher, which is acceptable, with some room for improvement." They missed an opportunity to suggest how do they think they might improve performance. At the minimum, they should have noted that they would address in their assessment plan.

With PLO2 (Effectively communicate theory, function, and practical aspects of EEE systems), the success rate for one course EEE 244 is better than for 201. Since they evaluate students differently (grade the former and provide credit for the latter), they stated that might be the difference. How can they analyze to determine if indeed this is the problem and possible remedies? Additionally, the University goal is "Communicate key knowledge with clarity and purpose both within the discipline and ***in broader contexts [IR's italics and bolding].***" The courses meet the technical disciplinary goals, but do the students have general presentation/speaking skills and does the faculty have evidence to demonstrate achievement? EEE 201 students improved from 41.5% to 50% in satisfactorily meeting the goal and for EEE 244, student's performance declined from 100% to 88.5%. The faculty didn't address these rate changes but should investigate for future assessment.

They state that PLO3 (Apply contemporary engineering techniques and tools for analysis and design) has a satisfactory performance rate around 75%. Have they concluded that this is acceptable, and they don't need further analysis or improvement?

Since the success rate is 80% or higher for PLO4 (Organize relevant information needed to address engineering problems), have faculty concluded that there is no need for improvement or that they can't achieve it?

For PLO5 (Professionalism) in their introductory EEE 201, their analysis indicated less than 50% of student reports don't reach satisfactory levels of original content in writing, and students need further training to appropriately reference and present material in their own words. Does the Department have any ideas on how to accomplish it, or do they need to conduct a further analysis? It is commendable that by the time students complete EEE 500 that they have significantly improved and reached scores of 100%. Is it maturation and practice that results in this improvement and therefore the value of the learning in the program or are there interventions the faculty can make earlier in the program?

For PLO6 (Propose engineering solutions that would benefit global environment and society), the faculty assessed with the Thesis/Project) for all students. In the Self-Study (p 10/11), they wrote: "Students are strongly encouraged to consider the significance of their project/research in wider societal and global contexts." They provide some example topics. If the faculty find that students can adequately address, then assessing the goal is appropriate, but if they do not, perhaps using a series of assignments in other courses might be a better approach to achieve satisfaction for the PLO.

ER Ramesh made only 2 recommendations concerning assessment. 1) Reduce current set of PLOs from six to four. 2) Consider assessing events such as the annual showcase where students present their work via posters and presentations to the public and industry to help students improve their oral and written communication skills. The ERs didn't understand how assessment works at CSUS. The 6 PLOs are University approved graduate program goals for which the Department doesn't have authority to change or eliminate from its assessment program. The ERs recommendation number 2 was valuable and the faculty should implement. The IRs recommend that faculty maximize that assessment by having

other graduate students evaluate other students and their own projects and that the faculty "capture" those evaluations as direct measure evidence for other PLOs, e.g. oral communication skills, critical thinking, etc.

Similar to their treatment of direct measures, the faculty identified and summarized some of their indirect measure results but failed to discuss their findings and how they might improve the program. Those measures were: graduate student and alumni surveys reflecting on program outcomes; site visits to industry; independent assessment by Department-level Industry Representatives; feedback from College's Industry Advisory Board; and employability statistics of our graduate students. For the Graduate Alumni Survey, it is valuable that they furnished a table with their PLOs and Institutional Learning Goals and the total percentage achievement. For the 6 goals, students reported achieving "Significant Extent" and "Adequate Extent" preparation. They only provided for one question the strengths and weaknesses of a very small number of student suggestions (Self-Study p 13): Reported strengths were deep insight to micro-electronics and analog circuits; excellent and professional team of professors…; theoretical approach was good…; and career readiness is strength. Weaknesses were: … include Java, Python, Linux, etc.; adding more courses into Digital design, verification and computer architecture; and graduate students should be taken to field trips relevant to their areas. The faculty should reflect on those comments and discuss in their self-studies if they will incorporate and why. Combining direct and indirect measures makes for a robust assessment program, and they should discuss with an Office of Academic Program Assessment (OAPA) representative.

Commendation: 2.C.1: IRs commend the successes that the Department has achieved and reported in their Self-Study.

Recommendation: 2.R.1: IRs recommend that the faculty study the Civil Engineering Department's Self-Study as an example of excellent program reflection.

Recommendation: 2.R.2: IRs recommend that but it discuss with an OAPA representative about various assessment techniques and reflection.

Recommendation: 2.R.3: IRs recommend that faculty think about maximizing evidence collection for as many PLOs as possible.

Element 3. To Improve Student Success (consider university/college goals on recruitment, retention, graduation, diversity, engagement)

The IRs commend the Department for course mapping to their PLOs. Additionally, the faculty created planning/advising documents that are a good practice for helping students navigate and complete the master's program. The faculty are available both formally and informally to their students.

The Department reported enrollment data disaggregated by Gender and Ethnicity. While it noted that international students predominate enrollment, again it didn't reflect on it. The latest National Science Foundation's statistics (2018; N=3,326) provided demographics for the field. Although the NSF's statistics are not as refined nor recent as those the University collects, national data provides a datapoint for some useful comparison.

Except for doing well with females (low 30% approximately), all other racial/ethnic categories are much smaller. Is this acceptable? If it isn't, then faculty can review the literature (see Appendix for selected samples), consult with similar programs, and look at professional association efforts to determine what strategies can they adopt to greater diversify their program. The ERs recommended that the faculty diversity their student's racial/ethnic diversity. The faculty concluded that their heavy dependence on international students and the decline in those applications affected the overall enrollment and graduation rates.

National Avg. (2018)	#	%
African-American	171	.05
Asian	745	.22
Hispanic/Latinx	279	.08
Native American	5	.0015
Other	282	.08
White	1,844	.55
Male	2,847	.88
Female	479	.14

https://ncsesdata.nsf.gov/sere/2018/ race

The Department described its successful efforts with partnerships (Self-Study p 22-23) and concluded that it uses them to strengthen the program but missed another opportunity to state how and why. "The results and feedback obtained during the visits are combined and studied to identify the program strengths and required improvements. In conclusion, through teaching, research, office hours, advising, mentorship, research, and connecting students with different college and university offices such as the ECS Career Center, the EEE faculty interacts with the students in the graduate program on a regular basis, which builds stronger links and provides better understanding between faculty and students, helping to close the gap and identify ways to improve the attainment of the student outcomes." The faculty can conduct periodic surveys to determine if the students agree that those programs truly contribute to a successful program. The IRs conclude that all the efforts the faculty listed potentially contribute. Faculty offered some examples (Self-Study p 5-6) of how the IEEE Sacramento State Student Branch organization conducts several technical and social events, (e.g. invited talks from people in industry), resume workshops, etc., benefit the students. Faculty should consider periodically capturing student responses (an indirect measure) as evidence of value for these types of activities.

Commendation: 3.C.1: IRs commend that the Department has valuable planning/advising documents for the students.

Recommendation: 3.R.1: IRs recommend that the faculty investigate various avenues for racial/ethnic Diversification.

Recommendation: 3.R.2: IRs recommend that the faculty furnish more discussion about how partnerships enhance the program in future self-studies.

Element 4. To Build Partnerships and Resource Development to Enhance the Student Experience (consider university/college goals on university as place, university experience, community engagement)

The Department offered several partnership avenues in enhancing the student experience. For example, the Department noted that they have (1) "invited local industry professionals as part of our Industry Liaison Committees to increase bilateral relationship between our department and regional industries. These activities have undoubtedly helped our students in pursuing their future careers." They also indicate that the Department (2) "enjoys longstanding relations and partnerships with numerous other industries with regional and global presence like Intel, SMUD, PG&E, Cadence Design Systems, ARM, Xilinx, etc. These partnerships resulted in significant equipment, software, monetary and other in-kind donations to the EEE department over the years to support our MS program."

The IRs acknowledge that building and maintaining these partnerships are challenging and commend the Department for doing so. At the same time, the IRs recommend that the Department adopt a more data-driven approach and more clearly and explicitly examine the pathways through which students' experience is enhanced through these relationships. For instance, if the student experience is enhanced through (1) career opportunities and (2) resources, the Department, perhaps through its "Student Success Committee," might consider analyzing to what extent these relationships have been effective: for instance, how many students received job offers through this avenue, what sorts of jobs, and so forth. Additionally, faculty should furnish examples that demonstrate reflection and changes that strengthen their program (Self-Study Section D.2 p 25). For example, their Student Success Committee "identified key pedagogical bottlenecks in critical courses to reduce D/F/W rates" but didn't provide any details or how they resolved the problems.

This can also potentially address and elevate an ER's recommendation to "consider assessing events such as the annual showcase where students present their work via posters and presentations to the public and industry to help students improve their oral and written communication skills."

Commendation 4.C.1: The IRs commend the Department for its partnerships that enhance graduate student's educational/research experience.

Commendation 4.C.2: The IRs commend the Department for its gifts, grants, and contracts that provide revenue, educational, and research experience for students and faculty.

Recommendation 4.R.1: The IRs recommend that the Department consider and assess regional partnerships and resource development using data in their long-term planning to quantify and enhance student experience.

Element 5. To Improve Strategic and Budget Planning and Operational Effectiveness and to Ensure Sustainability (consider university/college goals on innovative teaching, scholarship, research, university as place, university experience)

The Self-Study offered several strategies for maintaining and enhancing the program quality and sustainability including structural changes and enhancement to the program since last review, including strategic initiatives, hiring plan, and cost/revenue concerns and opportunities. In particular, in hiring, the

Self-Study noted that “As of Fall 2022, the EEE Department has a total of 15 full-time faculty (13 tenured/tenure track; 2 lecturers). However, three of the tenured faculty are in the FERP (Faculty Early Retirement Program).” While the Department noted that “hiring new faculty is always a high priority for our department” and offers a thorough descriptive analysis (Self-Study p 26-27), they could better reflect on the effectiveness of their faculty retention efforts (as evidenced by the “sudden leave of the only full-time tenured faculty member in the Controls area”), and the effectiveness of their plans for faculty recruitment, including in the domain of part-time faculty hiring.

For example, the Self-Study (p 28) reported that “the college allocates funds for student graders and tutors for each program. Tutors are also provided through the university Faculty Student Mentor Program. In addition, the university offers teaching support services for faculty through the Center for Teaching and Learning.” However, it is unclear whether and how the Department will benefit from such student assistants. Faculty should provide a rationale with how they can assess with evidence to better justify their need.

A more in-depth reflection and assessment of the needs in these domains would improve the Department’s Self-Study for its goal of sustainable improvement. It would also address ER’s recommendation for a “3-5 year hiring plan to recruit new tenure track faculty and replace retiring faculty.”

Recommendation 5.R.1: The IRs recommend that Department develop a plan that includes academic personnel hiring needs that incorporates full-time and part-time faculty as well as any teaching assistants.

III. Appendix:

Kuleshov, Y. A., Rada, M. E., & Lucietto, A. M. (2021). Minority Graduates in Engineering Technology: Trends in Choice of Major. ASEE Annual Conference and Exposition, Conference Proceedings.

Lucietto, A. M., & McNally, H. A. (2017). Encouraging the diversity of graduate students in technology. Proceedings - Frontiers in Education Conference, FIE, 2017-October, 1–5. https://doi.org/10.1109/FIE.2017.8190483

Manoharan, S., Choudhuri, S., Krug, B., & Plotkowski, P. D. (2022). Developing a Strategy to Include Financially Disadvantaged Undergraduate Students into Graduate Engineering Programs. 2022 CoNECD - Collaborative Network for Engineering and Computing Diversity.

MOU/Action Plan

Program: M.S. in Electrical & Electronic Engineering (EEE)

College: Engineering & Computer Science (ECS)

Date: 09/14/2023 Program Review 2YR Update 4YR Update 6YR Update

Program Review Finding **Cite self-study, external review, internal review, and/or accreditation documentation**	**2 YR** **List goal, success indicator, responsible parties, and resource implications.**	**4 YR** **List goal, success indicator, responsible parties, and resource implications.**	**6 YR** **List goal, success indicator, responsible parties, and resource implications.**
To Maintain Success			
Success: Program offers industry relevant curriculum. Develop graduate pathways that engage student and local industry interests in Power/Energy	Consider current interests in EEE subfields, which are growing and which are no longer operationally viable. Create a hiring plan to intentionally align faculty expertise with popular subfields and away from less popular subfields. Determine if there is enough interest for a stand-alone MS. Need around 20 students annually in addition to MS EEE, and 5 committed faculty.	Continue to explore student demand for a new MS in Power Engineering. Explore student demand for a new area in Biomedical Engineering or Mixed Signal Design. Discontinue areas/courses with declining enrollment. Revise hiring plan to intentionally align faculty expertise with popular subfields and away from less popular subfields	Assess MS EEE and MS Power Engineering as stand-alone degrees. Both must meet the CSU minimum degree awarded threshold.
To Improve Student Learning (consider university/college goals on learning, research/scholarship, diversity)			
Improve student performance for PLO1: Ability to apply core and advanced Electrical and Electronic Engineering knowledge and skills to synthesize and analyze as a part of the design process.	Develop a rubric and assess students' ability to apply core and advanced Electrical and Electronic Engineering knowledge and skills to synthesize and analyze as a part of the design process for each M.S. project/thesis submitted. Host curricular/assignment share event for all faculty (even invite other departments) Faculty to review current	Faculty discusses assessment results from thesis assessment, and implements intentional strategies for improvement. Implement Curricular, Assignment, etc. change based on assessment. Partner with other ECS departments, Graduate Studies, Library as needed.	Faculty Discusses assessment results, and strategies for improvement. Implement Curricular, Assignment, etc. change based on assessment. Partner with other ECS departments, Graduate Studies, Library as needed.

	material in core courses and obtain ideas from faculty to make projects more effective to learning assessment results, and strategies for improvement and obtain ideas to make projects more applied to current global challenges and applications		
Improve student performance for PLO2 (effectively communicate theory, function, and practical aspects of EEE systems.	Work with Graduate Studies to arrange graduate level writing support. Develop a rubric and assess writing via ***showcases.*** Work with Faculty to develop oral/poster presentations in all core courses.	Faculty discusses assessment results from showcases, and implements intentional strategies for improvement.	Faculty discusses assessment results from showcases, and implements intentional strategies for improvement.
Close the loop on all PLOs before next program review.	Faculty are aware what courses/assignments are responsible for assessment. Learning for each PLO is consistently being conducted and discussed.	Consider ways to further synergize assessment with other activities. Such have industry partners assess using developed rubrics at showcases.	Faculty discusses assessment results from showcases, and implements intentional strategies for improvement.
To Improve Student Success (consider university/college goals on recruitment, retention, graduation, diversity, engagement)			
Improve recruitment of students with an eye to diversity.	Develop and implement strategies to directly recruit CSUS alum working in local industry. Start with existing partners such as partners Intel, SMUD, PG&E. Develop and implement strategies to directly recruit CSUS alum via CSUS Alumni Association, International Ambassador programs, and MOUs with international universities.	Develop and implement strategies to work with industry partners to recruit graduate students. Work with the development officer to develop corporate financial support programs for graduate students such as scholarships, tuition, remission, or paid time to attend classes.	Review enrollment trends (disaggregated by race/ethnicity, gender, international, etc.) over past 6 years, and assess which strategies are working and develop new tactics.
Improve time to degree 100% in 2YR	Collect data on time to degree. This is a 2 yr. degree. 100% should graduate in 2. Reach out to students still in program after 3 yrs. to encourage completion of degree	Re-Examine Data and adjust strategies to meet goal.	Re-Examine Data and adjust strategies to meet goal.

	Faculty discuss data and gather additional information on why people drop out or barriers to on-time graduation. Student support implemented and barriers removed.		
Use post-graduation data to make curricular change and support student success.			
To Build Partnerships and Resource Development to Enhance the Student Experience (consider university/college goals on university as place, university experience, community engagement)			
Evaluate university resources such as Office of Graduate Studies (OGS), California Mobility Center (CMC) for student enhancement	Contact OGS and CMC for possible speakers at student gatherings	Re-Examine Data and adjust strategies to meet goal.	Re-Examine Data and adjust strategies to meet goal.
Actions planned/in progress	TBD		
To Improve Strategic & Budget and Operational Effectiveness and to Insure Sustainability (consider university/college goals on innovative teaching, scholarship, research, university as place, university experience)			
Seek grants that support growing areas, new faculty, and planned programs	2 new grants Computer Architecture & Digital Design 1 new grant in industry 3 new scholarships from industry	2 new grants in Power Systems 1 new grant in industry	
Encourage Faculty to include students in their research.			
	Improve industry partnerships to improve student success, check progress over past 2 years	Re-Examine Data and adjust strategies to meet goal.	Re-Examine Data and adjust strategies to meet goal.

Additional recommendations

External reviewer recommended to **reduce current set of PLOs from six to four. However, CSUS GLO (Graduate Learning Outcomes) policy requires us to align department PLOs with six university GLOs.**

Mahyar Zarghami M. Zarghami

Department Chair Name/Signature

Kevan Shafizadeh K. Shafizadeh

College Dean Name/Signature