ACADEMIC SENATE

Committee on Academic Planning and Review

ANNUAL PROGRAM REPORT

College	College of Science
Department	Engineering
Program	Computer Engineering
Reporting for Academic Year	2019-20
Last 5-Year Review	2015-16
Next 5-Year Review	2022-23
Department Chair	Saeid Motavalli
Date Submitted	10-01-2020

I. SELF-STUDY

Five-Year Review Planning Goals

5-Year Plan:

1. Summary of program changes: Extensive advising main change is the transfer to a semester-based program. The aim of advising was not to delay any student's graduation. We are solving inconsistencies between the quarter versus semester system for new transfer students on a case-by-cases basis but expect this to be solved within 2-3 years as transfer students from the quarter system all graduate.
2. Faculty: No faculty changes this year.
3. Research: The Computer Engineering faculty are active in research and have been successful in publishing their work. Growth in research is a goal that the engineering faculty are aggressively pursuing. Fields of growth are in machine learning and in combating COVID-19.
4. Laboratory Development: Engineering is being allocated space for faculty research and teaching in ScS 125. The space is being utilized for the development of an electronics laboratory and other computer engineering research space requirements. Two computer engineering faculty and faculty from computer science work in this laboratory.
5. Equipment: Through A2E2 annual funding and IT department resources we have upgraded the computer engineering laboratory ScN 237 but due to COVID-19 the VBT 223 lab upgrades are still pending.
6. Growth: We anticipate that the growth will continue and make it viable to start offering a graduate program in Computer Engineering.

A. Progress Toward Five-Year Review Planning Goals

A new tenure-track faculty, Alex Sumarsono, joined the program in the Fall of 2019. He replaced Howard Lei who left in 2017.

B. Program Changes and Needs

Overview: The Computer Engineering program was established in 2007 as an option under engineering. The program is now a standalone accredited major. The enrollment in the program has been increasing consistently. As of the fall quarter of 2019, the enrollment is 161 students. Three tenure-track faculty, Roger Doering, James Tandon, and Alex Sumarsono support this program.

Curriculum: We have transformed the curriculum in transition to semester offerings. The transformed curriculum satisfies accreditation requirements and is in line with the needs of its constituents.

Students: The number of students has increased from 19 in 2012 to 161 in the fall of 2019.

Faculty: Three tenure-track faculty serve the Computer Engineering program.

Staff: We have two full time staff for the School of Engineering, Mrs. Lisa Holmstrom, Engineering Advisor and a laboratory technician, Mr. Linh Nguyen**.** We also have a part time ASC who is with engineering for 8 hours a week.

Resources: The ScS 125 research laboratory is functional and equipped with drones and other research equipment. Dr. James Tandon and Alex Sumarsono conduct research in that lab. ScN 237 computer architecture lab is equipped with electronic test equipment and computers for student lab classes, and is used for research by Dr. Doering and his research assistants.

Assessment: Computer engineering is an accredited program. As part of the accreditation process, a systematic assessment and evaluation plan has been in place for five years. The details of assessment activities are given below.

II. SUMMARY OF ASSESSMENT

A. Program Learning Outcomes (PLO)

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (ILO 1)
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. (ILO 1 & 5)
3. An ability to communicate effectively with a range of audiences. (ILO 2)
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. (ILO 3, 4 & 5)

5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. (ILO 3 & 4)
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (ILO 1 & 2)
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies. (ILO 1, 2, & 4)

B. **Program Learning Outcome(S) Assessed**

List the PLO(s) assessed. Provide a brief background on your program's history of assessing the PLO(s) (e.g., annually, first time, part of other assessments, etc.)

Year 1: 2019-2020	
1. Which PLO(s) to assess	2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. **(ILO 1 & 5)**
2. Assessment activity	Exam Problems
3. Assessment instrument	Program rubric
4. Sample (courses/# of students)	ENGR 230 Electric Circuits
5. SLO from the course	1) Understand the operation of basic circuit elements - resistors, capacitors, inductors, operational amplifiers 2) Analyze and compute electrical quantities of voltage, current, and power in a circuit with DC and sinusoidal inputs 3) Utilize circuit analysis software and hardware to compute electrical quantities 4) Develop greater general knowledge of household electronic devices
6. Time (which semester(s))	Fall 2019
7. Responsible person(s)	Prof. Sumarsono

8. Ways of reporting (how, to who)	The results (quantitative and qualitative) will be reported by faculty to the department chair via completion of the course Faculty Self-Assessment form.
9. Ways of closing the loop	Interaction between chair, faculty and industrial advisory board

The program learning outcomes assessed for 2019-2020 are ILOs 1 and 5. The PLOs were assessed by using results from homework assignments. Since the BS in Computer Engineering is a new program that officially began in 2013, this year is part of the second 5-year cycle of assessment.

C. **Summary of Assessment Process**

Summarize your assessment process briefly using the following sub-headings.

Instrument(s): *(Include if new or old instrument, how developed, description of content)*

The instruments used to assess PLO's were homework assignment problems. Since professors used different grading scales, each question normalized to a rating scale 1-4 with 1 being the lowest score and 4 being the highest score. Questions focused on engineering data analysis and circuit design and synthesis.

Sampling Procedure:

Students in different classes were assessed based on specific course materials in the computer engineering discipline. Problems were chosen by the proctoring professor to be exemplary of the material ENGR 230.

Sample Characteristics:

The course used for assessment is a required course in the computer engineering discipline. Correct completion of each question requires essential knowledge for completion of the degree program. The selection was done in consultation between the individual proctoring professors, the assessment coordinator, and the department chair for computer engineering.

Data Collection: *(include when, who, and how collected)*

Problems were collected by the responsible data assessment coordinator. Raw data scores were normalized across all sample problems to the 1-4 scale for correctness.

Data Analysis:

ENGR 230
Item: Calculate optimized power consumption of a circuit.
Average score (out of 4): 3.81 (16 submissions)
Score of 1: 0 Score of 2: 1 Score of 3: 1 Score of 4: 14
Score of 3 or higher: 93.8%

ENGR 230
Item: Calculate power transferred to a circuit load.
Average score (out of 4): 3.5 (16 submissions)
Score of 1: 2 Score of 2: 0 Score of 3: 0 Score of 4: 14
Score of 3 or higher: 87.5%

Rubric for ILO1:
(1) Less than 25% of circuit specified correctly.
(2) Correctly specified 25% to 50% of circuit.
(3) Correctly specified 50%-75% of circuit.
(4) Correctly specified greater than 75% of circuit.

Rubric for ILO5:
(1) Correctly analyzed material and power consumption for up to 25% of circuit.
(2) Correctly analyzed material and power consumption for 25% to 50% of circuit.
(3) Correctly analyzed material and power consumption for 50% to 75% of circuit.
(4) Correctly analyzed material and power consumption for more than 75% of circuit.

D. **Summary of Assessment Results**
Summarize your assessment results briefly using the following sub-headings.

Main Findings:

With respect to PLO2: Students in ENGR 230 performed exceptionally well on the homework assignments. Pedagogy did not change.

Recommendations for Program Improvement: *(Changes in course content, course sequence, student advising)*

This course is taught to CMPE students and INDE students. The high level content and the prerequisites as described in the catalog can remain the same. However, since students taking this course have different backgrounds, separate sections should be offered with different sets of assignments appropriate for each major.

CMPE students need this course as a foundation for higher level courses. While the lab is quite important, students should focus on acquiring in-depth understanding on the theoretical and mathematical aspects of the course.

INDE students should do a lot of hands-on work where the focus is more on applying the concepts from this course. In order that they can do it correctly, they need to properly understand the equations and the formulas although they may not necessarily need to know the derivations.

Next Step(s) for Closing the Loop: *(Recommendations to address findings, how & when)*

Professors in computer engineering should convene to prepare the assessment questions for each class. Additionally, creating questions that test introductory, practice, and mastery levels, should be considered. However, the assessment questions should be balanced in that they can be solved at the end of a final exam.

Other Reflections:

The syllabi and assessment questions used for CAPR assessment and ABET assessment should be co-created to minimize the impact of program assessment to the student learning experience.

E. **Assessment Plans for Next Year**

Summarize your assessment plans for the next year, including the PLO(s) you plan to assess, any revisions to the program assessment plan presented in your last five-year plan self-study, and any other relevant information.

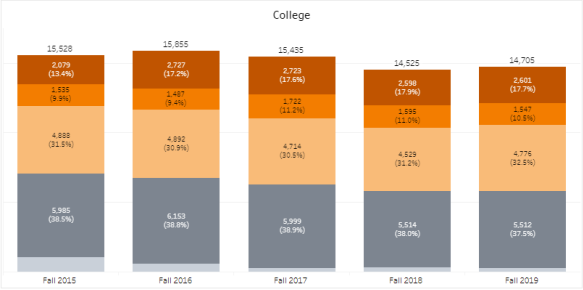
Year 2: 2020-2021	
1. *Which PLO(s) to assess*	6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. **(ILO 1 & 2)**
2. *Assessment activity*	Final Project report and presentation
3. *Assessment instrument*	Program rubric
4. *Sample (courses/# of students)*	a-CMPE 321 Computer Architecture
5. *Time (which semester(s))*	a-Fall 2020

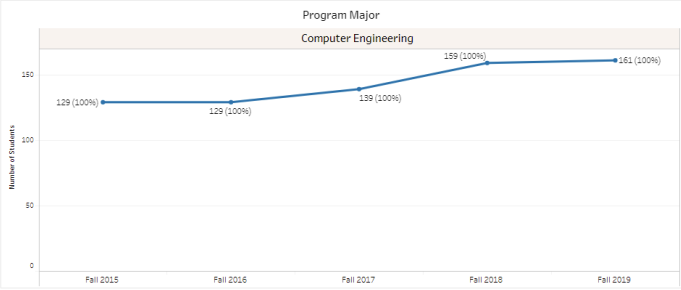
6. *Responsible person(s)*	a. Prof. Tandon
7. *Ways of reporting (how, to who)*	The results (quantitative and qualitative) will be reported by faculty to the department chair via completion of the course Faculty Self-Assessment form.
8. *Ways of closing the loop*	Interaction between chair, faculty and industrial advisory board

III. DISCUSSION OF PROGRAM DATA & RESOURCE REQUESTS

Discussion of Trends & Reflections

The following table is enrollment data extracted from Pioneer Data Warehouse. This data indicates that the Computer Engineering enrollment is increasing at a constant rate. The current data as of Fall of 2018 stands at 159. The current faculty of Computer Engineering are; Roger Doering James Tandon and Alex Sumarsono . The program is accredited by ABET until the Fall of 2022.





Computer Engineering: Sex

		Fall 2015		Fall 2016		Fall 2017		Fall 2018		Fall 2019	
		n	%	n	%	n	%	n	%	n	%
Undergraduate	Female	15	12%	13	10%	10	7%	13	8%	13	8%
	Male	114	88%	116	90%	129	93%	146	92%	148	92%
	Total	129	100%	129	100%	139	100%	159	100%	161	100%
Grand Total		129	100%	129	100%	139	100%	159	100%	161	100%

Notable Trends:

1. Growth in enrollment

2. Strong industry demand for the graduates

3. Active Advisory Board Council

4. Maintaining accreditation

Reflections on Trends and Program Statistics: Program growth is slow and steady with 161 students in Fall 2019.

Request for Resources *(Suggested length of 1 page)*

1. **Request for Tenure-Track Hires**, Accreditation report from last time required more faculty in the program. However, we still have only 3 faculty members at this time.

2. Request for Other Resources