ANNUAL PROGRAM REPORT

College	College of Science
Department	Engineering
Program	Computer Engineering
Reporting for Academic Year	2021-2022
Last 5-Year Review	2015-2016
Next 5-Year Review	2022-2023
Department Chair	Saeid Motavalli
Author of Review	James Tandon
Date Submitted	

I. SELF-STUDY *(suggested length of 1-2 pages)*

A. Five-Year Review Planning Goals

Present your planning goals from your last 5-year plan.

1. Summary of program changes: The main change will be the transfer to a semesters-based program. The Computer Engineering curriculum has been transformed in such a way that it satisfies the accreditation requirements, and will produce technically stronger graduates. This has been accomplished by fundamental changes to courses, teaching methods and course requirements. A new faculty, Dr. James Tandon, has joined the program in Fall 2015.
2. Faculty: As mentioned in the ABET review above, we have to address their concern before the next visit.
3. Research: The Computer Engineering faculty are active in research and are being successful in securing funds for their research. Growth in research is a goal that the engineering faculty are aggressively pursuing.
4. Laboratory Development: Engineering is being allocated space for faculty research and teaching. The space is going to be utilized for the development of an electronics laboratory, which will contain high-speed RF equipment that will allow students to complete state-of-the-art circuits. Two computer engineering faculty and a construction management faculty will be using this lab to conduct research and support their classes.
5. Equipment: Through A2E2 annual funding and other College of Science resources, we will purchase lab equipment that will partially be used to equip this space.
6. Growth: Computer Engineering program is the fastest growing undergraduate program in Engineering. We anticipate that the growth will continue and make it viable to start offering a graduate program in computer engineering.

B. Progress Toward Five-Year Review Planning Goals

Report on your progress toward achievement of the 5-Year Plan. Include discussion of problems reaching each goal, revised goals, and any new initiatives taken with respect to each goal.

1. We have addressed the lack of faculty by hiring a new faculty member, Dr. Alex Sumarsono to join the program. Additionally, we have established a relationship with the Computer Science department where they teach four core courses to the Computer Engineering program so Computer Science Faculty including Dr. Varick Erickson, Mr. Jonathan Traugott, and Ms. Indra Jyothi Yellapragada, help support the Computer Engineering program.
2. Faculty have created a Computer Engineering research program whitepaper which we distributed to donors in Silicon Valley and to companies at large. This is to help increase investment in our program from industry. Based on this whitepaper, we have received

funding from industry for our senior design program. Faculty continue to aggressively pursue a research agenda and publish papers.
3. State-of-the-art electronic test equipment has been acquired including a 26GHz signal analyzer, a 26.5GHz analog signal generator, and a 10GHz oscilloscope. Our students are now capable of building modern RF and high-speed analog/digital electronic circuits.
4. The COVID19 pandemic caused student enrollment to drop by approximately 15% but enrollment is down across all majors. As students return to campus, we expect the program to increase enrollment faster than other programs in the engineering department.
5. We have submitted a new self-study report to ABET for a new 5-year accreditation round. Once we receive news of accreditation, we will submit the self-study report for assessment.

C. Program Changes and Needs

Report on changes and emerging needs not already discussed above. Include any changes related to SB1440, significant events which have occurred or are imminent, program demand projections, notable changes in resources, retirements/new hires, curricular changes, honors received, etc., and their implications for attaining program goals. Organize your discussion using the following subheadings.

Overview: The most significant change is the shift in curriculum requirements from quarters to semesters. Several course requirements were implemented to reduce unit requirements to a lower level. Because of the dramatic shift, we have fine-tuned the program requirements for graduation to reduce unit load, reduce the time to graduation, and increase the probability of student success.

Curriculum: This past year, the most major change was the recognition that CMPE 321 and CMPE 322 were a lecture/lab class pair that complimented each other. In order to reduce the probability that students would be held back an extra year due to prerequisites not being allowed, the two classes have been merged into a single class: CMPE 323. Additionally, prerequisites for classes were reviewed to reduce year-over-year dependencies between classes. The following prerequisite changes were implemented: CMPE 492 now requires CMPE 330; CMPE 344 now requires only CS 201.

Students: As indicated in the previous section, the student enrollment fell due to the COVID19 pandemic. However, this is not unique to the program. We fully expect enrollment to continue growing as things return to a new normal.

Faculty: Over the past 5 years, one tenure-track faculty member departed to work in industry for a higher salary. However, we hired one new tenure-track faculty member to compensate.

Staff: We have a department administrator who is shared with four other programs (undergraduate and graduate programs in Industrial Engineering and Construction Management). Also, we have an engineering technician who is responsible for managing lab hardware, and purchases, and information technology. The department administrator has changed once, and the

Resources: *(facilities, space, equipment, etc.)* We have brought up the new quadcopter/drone lab which has a working quadcopter drone cage. Additionally, we have developed the RF/high-speed electronics lab which holds our more advanced test equipment.

Assessment: We have submitted our ABET self-study report to the accreditation commission and the program has been reviewed by the representatives. We are eagerly awaiting their response

Other: *(e.g., major program modifications)* none.

II. SUMMARY OF ASSESSMENT *(suggested length of 1-2 pages)*

A. Program Learning Outcomes (PLO)

List all your PLO in this box. Indicate for each PLO its alignment with one or more institutional learning outcomes (ILO). For example: "PLO 1. Apply advanced computer science theory to computation problems (ILO 2 & 6)." 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.)*

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. 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 PLOs were midterm and final exam questions. Since professors used different grading scales, each question is 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 system design and synthesis.

Sampling Procedure:
Students in different classes were assessed based on specific course material in the computer engineering discipline. The knowledge to be successful in these courses is cumulative where CMPE 221 material is introductory level, CMPE 321 material is practice level, and CMPE 480 is mastery level. Problems were chosen by the proctoring professor to be exemplary of the material in each course.

Sample Characteristics:
The courses used for assessment are all required courses 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. Next, the scores to facilitate comparisons between Introductory, Developmental, and Mastery levels.

Data Analysis:

Performance Indicator 1: Write a bug-free assembly language program that produces a specified output.
Performance level: Introductory

Rubric:
(1) Unable to write most fundamental components of the program
(2) Program has 5 or more bugs
(3) Program has fewer than 5 bugs but more than 1 bug
(4) Program has 0-1 bugs

Course: CMPE 221
Semester: Fall, 2020
Item: Homework assignment 2

Score	# of Students
1	4
2	0
3	0
4	9
Total Students	*13*
Average Score	*3.08*
Score of 3 or Higher	*69%*

Performance Indicator 3: Design CPU components that correctly interfaces with other components for the proper execution of a computer program.
Performance level: Developmental

Rubric:
(1) CPU simulation does not run
(2) CPU runs but does not obtain positive score (# of correct instructions minus # of incorrect instructions) as determined by autograder program OR CPU runs for a little while before crashing.
(3) Positive score as determined by autograder program OR score does not stop counting up.
(4) Score of 40 or more out of 47 as determined by autograder program

Course: CMPE 321
Semester: Fall, 2020
Item: Final project

Score	# of Students
1	6
2	4
3	4
4	4
Total Students	*18*
Average Score	*2.33*
Score of 3 or Higher	*44%*

Performance Indicator 5: Design a VLSI layout under physical constraints.

Performance level: Mastery

Rubric:
(1) Specified less than 25% of connections and components for system
(2) Specified 25% or more connections and components for system
(3) Specified 50% or more connections and components for system; OR, Specified 75% or more connections and components for system but inputs complemented
(4) Specified 75% or more connections and components for system

Course: CMPE 480
Assessment 2:
Semester: Spring, 2021
Item: Homework assignment 3

Score	# of Students
1	1
2	4
3	1
4	9
Total Students	*15*
Average Score	*3.20*
Score of 3 or Higher	*67%*

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

Main Findings:
With respect to PLO2: Students in CMPE 221, and to a lesser extent CMPE 480 tend to either understand the material, or not understand it as reflected in the bimodal distribution of scores. While some people successfully complete the introductory training in CMPE 221, some people are unable to understand and use knowledge taught. This is less of a problem in CMPE 321 as the results are more even.
Students in CMPE 480 were generally able to complete the required assessment problem. Our departmental goal of having most students achieve 3 or better on the assessment was attained. For whatever reason, CMPE 321 had a large number of people who performed unsatisfactorily. Because more performance at the mastery level in CMPE 480 performed better, it suggests that the standard of grading in CMPE 321 is potentially too high.
Recommendations for Program Improvement: *(changes in course content, course sequence, student advising)*
Provide more simple examples for programs in CMPE 221. This technique will be used to help students who would normally score at the bottom. Students who come from a variety of backgrounds will have different expectations with respect to the homework assignments. Therefore some students will require more individual help than others.
Change CMPE 321 so that it has a less arduous final project. The final product should be implementation of a processor but it may be implemented in a hardware design language or the processor design should be simplified considerably so that more students can grasp the material.

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.

D. 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.

We plan to continue assessment with midterm exam questions and final exam questions where feasible for individual work for PLO 6. It will require assessment of group work and an ability to communicate. For PLO 6, group project grades and peer review questionnaires will be used for assessment. Also, written and oral assignments will be used for assessment. PLO 6 will be assessed by with a written assignment in ENGR 200 and with an oral presentation in CMPE 344.

III. DISCUSSION OF PROGRAM DATA & RESOURCE REQUESTS *(suggested length of 2 pages)*

Each program should provide a one-page discussion of the program data available through University Dashboard. This discussion should include an analysis of trends and areas of concern. Programs should also include in this discussion requests for additional resources including space and tenure- track hires. Resource requests must be supported by reference to University Dashboard data.

Requests for tenure-track hires should indicate the area and rank that the program is requesting to hire. If a program is not requesting resources in that year, indicate that no resources are requested.

A. Discussion of Trends & Reflections Notable Trends;
Summarize and discuss any notable trends occurring in your program over the past 3-5 years based on program statistics (1-2 paragraphs). You may include 1-2 pages of supplemental information as appendices to this report (e.g., graphs and tables).

We have sumerized the enrollment trend as follows;

Male 122 (94%)	Asian 42%	First Geneartion 62%
Female 8 (6%)	Latinx 33%	others 38%
	White 6%	

The enrollment in the program is at 130 count in Fall quarter of 2020. This is down from the all-time high of 161 in the Fall quarter of 2019. We believe this downward trend is a result of pandemic onset.

We have to increase the diversity of the students with respect to sex. We have very low number of female students in the program. We have discussed this issue with the faculty and trying to come up with concrete steps to promote computer engineering major to female students. This is a nationwide problem that needs to be addressed.

Reflections on Trends and Program Statistics:
Provide your reflections on the trends discussed above and statistics and supplemental information presented in this report.

Must work on increasing the appeal of the computer engineering major to female students.

B. Request for Resources *(suggested length of 1 page)*

1. Request for Tenure-Track Hires: provide evidence from trends provided
   Due to an enrollment drop that can be attributed to COVID19, no requests for tenure-track hires at this time. We expect student enrollment to start increasing again based on pre-pandemic trends.

2. Request for Other Resources
   We request $50 per student in the program ($6500) per year in order to purchase consumable lab supplies. We also request an extra $50 per student ($6500) per year in order to purchase repair/replace lab test equipment that has been damaged by students during the learning process. As our students are learning how to use hardware safely and effectively, we make an extra effort to teach them about the dangers of using lab equipment improperly. We instruct them step-by-step in lab hardware usage. Unfortunately, with first time users, the probability of misusing hardware is relatively high. Therefore lab equipment repair/replacement is a recurring cost.Total monies requested is $13,000 per year.