ACADEMIC SENATE
Committee on Academic Planning and Review

ANNUAL PROGRAM REPORT

College	Science
Department	Engineering
Program	B.S. Industrial Engineering
Reporting for Academic Year	2019-2020
Last 5-Year Review	09/2016
Next 5-Year Review	2022-2023
Department Chair	Saeid Motavalli
Date Submitted	10/1/2019

SELF-STUDY *(suggested length of 1-3 pages)*

A. Five-Year Review Planning Goals

1. The major change was the transfer to a semester-based program. The Industrial Engineering curriculum has been transformed in such a way that it both satisfies the accreditation requirements and will produce technically stronger graduates. This has been accomplished by fundamental changes to courses, teaching methods and course requirements. The first year of the implementation of the new curriculum has gone smoothly. The students that are in transition have been advised properly and are now on their way graduate on time.

   Faculty: As mentioned in accreditation review report following the 2015 visit, we have to address their observation that the program needs additional faculty before the next visit (2021).

   Research: The Industrial Engineering faculty are active in research and are publishing in referred journals. They have strong industry connections and as such, our students have the opportunity to complete several real industry based projects by the time of graduation.

2. Laboratory Development: We have purchased two CNC machines and a robotics work cell that are installed in VBT 230 for manufacturing related courses. These machines will be used in ENGR 210, and some graduate courses.

3. Equipment: Through A2E2 annual funding and the normal refresh cycle of computers by IT, we are keeping the Industrial Engineering Laboratories current. The Engineering Computer Lab. (VBT 223) is due for a refresh that will be done during the Christmas break of 2019. This lab is used for several IE courses.

4. Enrollment: Student enrollment in Industrial Engineering program has stabilized at around 100.

5. Excess credits: The program requires 181 credit hours to complete. The transformed curriculum just meets the minimum accreditation requirements in the areas of basic science and engineering hours. No engineering electives could be added to the program.

B. Progress Towards Five-Year Review Planning Goals

1. Successfully transformed the curriculum to a semester-based program.

2. We are planning to request one tenure track position for the industrial engineering program as suggested in the findings of our last accreditation visit report. We will submit our request such that we have the new faculty by the time of the next accreditation visit in the Fall of 2021.
3. The manufacturing laboratory has been upgraded with two new CNC machine tools and a robotics cell.
4. Enrollment in industrial engineering has remained steady during the past 3 years.

C. Program Changes and Needs

Overview: The industrial engineering program started in the year 2000 and has been steadily growing with the enrollment stabilizing in the past three years. Since 2004 we have not hired any faculty for this program. Our last accreditation review was conducted in the Fall quarter of 2015. Their findings included the fact that the program needs new faculty members to stay current. We are planning to request a faculty position for this program in this academic year.
Curriculum: The transformed curriculum is designed to include more active learning practices and includes courses and material that are in line with the industry trends for industrial engineers.
Students: Demand for industrial engineering graduates are relatively strong. Most of our graduates are employed in engineering positions, mainly in the Bay Area.
Faculty: Since 2004, we have had 3 faculty dedicated to the industrial engineering and M.S. in engineering management programs. These include Helen Zong, David Bowen and Farnaz Ganjeizadeh. The program needs one additional tenure-track position
Staff: We have two full time staff for the School of Engineering, Mrs. Lisa Holmstrom our student advisor and a laboratory technician, Mr. Linh Nguyen. We also have a joint staff with Math and Computer Science departments
Resources: We have upgraded our Manufacturing processes equipment and are planning to upgrade the engineering computer laboratory, VBT 223.

Assessment: An extensive assessment process is in place for the industrial engineering program. Sample results are provided in the following section.

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**

We have assessed the following SLO for the Industrial Engineering program during the 2019-20 Academic Year:

(1) Year 5: 2017-2018	(2)
1. Which pLO(s) to assess	PLO 1: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (ILO 1). PLO 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)
2. Assessment indicators	c-
3. Sample (courses/# of students)	c-ENGR 220 , ENGR 200
4. Time (which quarter(s))	c-Fall 2018
5. Responsible person(s)	c- Rick Choy, Fadi Casronovo
6. Ways of reporting (how, to who)	The results will be reported by faculty to the department chair via completion of the course Faculty Self-Assessment form.
7. Ways of closing the loop	Interaction between chair, faculty and industrial advisory board

C. **SUMMARY OF ASSESSMENT PROCESS:**

PLO 1 was assessed in ENGR 220 in Fall of 2018. In this course, students complete several HW assignments using an on-line tool called Mastering Engineering. This tool provides instant feedback to students as they complete their homework. There are also several quizzes, two exams and a final. At the end of each semester the faculty completes a course assessment form that summarizes all assessment activates related to the course learning outcomes as mapped to PLO's. The assessment form also includes instructors feedback on the strengths and weaknesses of the course based on student evaluations and instructor's observations. The assessment forms for all courses are collected and the summary is presented to the advisory board where, faculty and other members of the board make decisions on how to improve the program.

PLO 4: Students in ENGR 200 work on several case studies and assignments. Some of these assignments are related to engineering ethics. As an example, Assignment #1 requires students to write a mini-paper on engineering ethics and sustainability. This paper discusses preparing the code of conduct for a company, one should assure that the values of the company are reflected. As part of this assignment, students review recent papers related to ethics and sustainability and prepare a summary.

D. Summary of Assessment Results:

Main Findings:

PLO 1: Linear algebra, trigonometry, geometry, and calculus are widely used in this course. The two exams and the final exam all included use of mathematics and physics. Vector analysis in 2D and 3D are extensively used and the PLO is assessed using the three exams. Concepts such as free body diagram and vector operations were part of every case study discussed. Specific tools used for the assessment were exam 1 and exam 2 and questions 2 and 3 in the final exam. In midterm 1, 32% of the students achieved less than 70% and 51% achieved more than 85%. In midterm 2, 67% were less than 70% and 38% achieved more than 85%. In the final exam, 55% were less than 70% and 27% were more than 85%.
PLO 4: The overall average for this class was 84% with the highest grade of 94% and lowest of 48%. The performance of students in Assignment #1 that required students to develop a company's code of ethics was 73%.

Recommendation for Program Improvement:

The plan for ENGR 220 is to add more math review sessions for students that are identified as weaker than average. For ENGR 200 the plan is to increase the scope of the class project.

Next Steps for Closing the Loop:

These outcomes will again be assessed in the Fall semester of 2019. The results will be discussed with IE faculty and will be presented at our next Advisory Board meeting. The continuous improvement process will continue on an annual basis.

Assessment Plan for Next Year

According to our proposed assessment plan for the semester curriculum the following PLOs will be assessed:

Year 1: 2019- 2020	
1.Which PLO(s) to assess	PLO 6 An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (ILO 1 & 2) PLO 3: An ability to communicate effectively with a range of audiences. (ILO 2)
2.Assessment indicators	a-Exams, class projects, in class activities
3.Sample (courses/# of students)	a-INDE 340

4.Time (which quarter(s))	a-Spring 2020
5.Responsible person(s)	a-Prof. Ganjiezadeh or lecturer
6.Ways of reporting (how, to who)	The results will be reported by faculty to the department chair via completion of the course Faculty Self-Assessment form.
7.Ways of closing the loop	Interaction between chair, faculty and industrial advisor

The industrial engineering program started in the Fall of 2000 and has been steadily growing with the enrollment stabilizing in the past three years at around 100 students . Since 2004, we have not hired any faculty for this program. Our last re-accreditation review by ABET was conducted in the fall quarter of 2015. Their findings included a program observation cited below, indicating that the program needs new faculty members to stay current. We have not requested tenure track positions since the accreditation visit. We have to address this observation well before the next accreditation visit in the fall of 2021._

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 Industrial Engineering enrollment has stabilized at around 100 students. The Fall 2018 enrollment is at 102. The current faculty of Industrial Engineering are; David Bowen, Farnaz Ganjiezadeh and Helen Zong. The program is accredited by ABET until the Fall of 2022. We are planning to request a faculty position for industrial engineering and engineering management programs such that he/she is in place by the Fall quarter of 2021, which is the time for our next accreditation visit.

Notable Trends:

1. Stabilization of the enrollment

2. Strong industry demand for the graduates

3. Active Advisory Board Council

4. Maintaining accreditation

Request for Resources*:* We have upgraded the manufacturing laboratory and are in discussion with the IT Department to upgrade the Engineering Computer Lab. This upgrade will happen during Christmas break.

Request for Tenure-Track Hires: We have to add one new tenure-track faculty within the next two academic years in order to to keep the program current and satisfy the accreditation requirements.

Request for Other Resources:

N/A

Term		Industrial Engineering
Fall Quarter 2012	Total	18
Fall Quarter 2013	Total	54
Fall Quarter 2014	Total	78
Fall Quarter 2015	Total	109
Fall Quarter 2016	Total	120
Fall Quarter 2017	Total	122
Fall Semester 2018	Total	102
Source: Pioneer data *Date 9/19/2019*		