LDC Program Review – Annual Discipline Update for 2021-2022

PART A

## SECTION 1: BASIC PROGRAM/DISCIPLINE INFORMATION

SAC Name: **Engineering**

Disciplines included in this SAC: **ENGR**

SAC Chair(s): **David Goldman**

Faculty Department Chair(s): **David Goldman**

Program Dean/ SAC Administrative Liaison: **Diane Shingledecker**

Pathway Dean: **Alyson Lighthart**

Please highlight where your classes are offered.

Classes/Services offered at: CA / RC / SE / **SY** / NB / HC / WCC / Metro / CLIMB  Other: **Remote**

## SECTION 2: REFLECTING ON DATA

**All data cited below can be found here:**
https://www.pcc.edu/institutional-effectiveness/program-profiles/

### 2A. Enrollment (SFTE) per year; Location (where course is taught); Modality

The ENGR SAC is not aware of how SFTE is computed prior to 2015-16 but by anecdotal knowledge, as shown in *Table 1*, the enrollments in ENGR 101 did not double in 2015-16. The SFTE difference prior to 2015-16 has something to do with the way it was computed by the institution.

| SFTE | | | |
|---|---|---|---|
| Year | Total | Onsite | Remote |
| 2012-13 | 16.2 | 2.5 | 0.0 |
| 2013-14 | 15.3 | 1.1 | 0.0 |
| 2014-15 | 18.5 | 18.5 | 0.0 |
| 2015-16 | 32.4 | 32.4 | 0.0 |
| 2016-17 | 36.4 | 36.4 | 0.0 |
| 2017-18 | 39.5 | 39.5 | 0.0 |
| 2018-19 | 37.1 | 37.1 | 0.0 |
| 2019-20 | 34.5 | 26.6 | 7.9 |
| 2020-21 | 33.6 | 0.0 | 33.6 |

***Table 1: SFTE Enrollment Modality***

### 2A1. Does this data suggest any questions that the SAC would like to pursue?

The data indicates an enrollment decline (9.5%) across all engineering courses. A contributing factor in the decline of student enrollment should include the move from in-person to remote learning. This reasonable assumption can be substantiated by the numbers. In the academic year 2018-19, 98 percent of the total student FTE was offered onsite.

The data by gender and race, provided by Institutional Effectiveness, shown in the Table 2 in Section 2B, demonstrates that success rates for underrepresented students in the engineering gateway course, ENGR 101,

Introduction to Engineering, are in line with national trends. However, the ENGR SAC desires to make changes in curriculum that will improve the overall success rate of underrepresented groups.
The question raised by the data is causation.

A closer look at the data with a mind toward improving student enrollment would be in the success and retention rates for ENGR 101 students. Reflecting on the data an observation as to the foundational knowledge of students should be reviewed. The Engineering Fundamentals course, ENGR 101, is the gateway entry level course to this discipline. The success rate percentage of students taking a second-year engineering course is significantly higher than that of the entry level course. A question for the SAC to pursue would be the correlation between the level of success in the ENGR 101 course as it corresponds to the success rate of students in advanced courses requiring ENGR 101 as a prerequisite.

**2A2. Do the data suggest adjustments be made in your discipline, such as schedule or course offerings, with regards to enrollment? If yes, what ideas/strategies do you have that you would like to implement or have help with in the upcoming academic year?**

The data suggests success for underrepresented students in our gateway course, ENGR 101, Introduction to Engineering, is aligned with national trends for the success of underrepresented groups in Engineering. The data does not reveal causation. Determining causation to implement strategies for mitigation to improve the success rate for potential engineering students will be necessary.

Adjustments to ENGR 101 under consideration would be adding a discipline specific study skills component to course activities, provide more developmental and resource materials to students pursuing the discipline, and to improve the consistency of content delivery across the sections of ENGR 101.

Adjustments to ENGR 101:

- Adding collaboratively developed discipline specific study skills modules
- Creating a shared repository of course content in a D2L shell
- Aligning the curriculum's organization and structure across sections
- Scaffolding curriculum by segmenting qualitative and quantitative content
- Providing specific intervals of learning (such as part one and part two) within the course
- Integrating educational support materials in part one of the course

**2A3. Are there other data reports that you would find informative/useful with regards to enrollment? How would this information support decision-making for the SAC/discipline?**

Consistent from year to year is the data showing representation of female students and students of color falling off significantly in enrollment in the advanced courses. Success rates for students taking the 200 level courses is noticeably higher than that of students enrolled in the entry level gateway course. Access to data regarding the overall enrollment in 200 level courses among gender and race could be helpful in identifying reasons for this enrollment decline in contrast to its higher success rate.

**2A4. Is your program aware of any external influences that strongly affect recent enrollment? For example, state requirements, transferability challenges, other university policies, etc. Please explain.**

The global pandemic has significantly affected enrollment rates across the college. An argument can be made for a general decline in the overall student success and completion rate due to the pandemic. Also included are:

- Lack of a PCC vaccine requirement, especially since all our university partners have a vaccine requirement
- CMET department re-launched at CCET department
    - CMET degree included ENGR courses

Overall enrollments prior to the onset of the 2020 pandemic were fairly consistent, in the mid to upper 30 SFTE. Small variations in low population counts can result in large variations in percentages, but when enrollments are viewed as counts and not populations, the enrollments are fairly consistent and not concerning.

The negative influence of the pandemic on enrollment is obvious. The challenge and rigor of engineering results in students choosing not to enroll in remote learning at PCC. Returning to a face-to-face scenario will likely have a large impact on enrollments especially when the partner institutions of Portland State University and Oregon State University have returned to face-to-face courses. Students are choosing to attend our partner institutions instead of the remote learning PCC is offering.

**2B. Course Success Rates**

*Data Definition: Success rate represents the percentage of students who successfully complete a course. It is calculated as:*

$$\%\ S = \frac{\text{Number of students receiving a grade of A, B, C, P, PR, or CM}}{\text{Number of students receiving a grade of A, B, C, D, F, P, NP, I, W, PR, CM, N, UP}}$$

*PR, CM, N, and UP are non-credit grades used in the Adult Basic Education program.*

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012-13 | 88.0 | 87.1 | 88.3 | 0.0 | 0.0 | 0.0 | 93.3 | 0.0 | 93.3 | 0.0 | 87.5 | 87.1 | 85.7 | 91.4 | 85.9 |
| 13-14 | 81.5 | 80.0 | 81.7 | 0.0 | 0.0 | 0.0 | 83.3 | 83.3 | 87.5 | 0.0 | 66.7 | 81.3 | 78.6 | 83.3 | 85.1 |
| 14-15 | 88.0 | 95.3 | 86.5 | 0.0 | 100.0 | 0.0 | 91.3 | 80.0 | 85.7 | 0.0 | 94.7 | 88.7 | 73.5 | 90.0 | 88.2 |
| 15-16 | 86.1 | 93.3 | 85.0 | 0.0 | 0.0 | 0.0 | 76.9 | 77.8 | 90.5 | 0.0 | 90.0 | 86.8 | 83.3 | 91.7 | 87.0 |
| 16-17 | 88.5 | 93.5 | 87.3 | 0.0 | 0.0 | 0.0 | 85.7 | 0.0 | 81.8 | 0.0 | 90.0 | 87.7 | 85.7 | 96.4 | 82.4 |
| 17-18 | 85.0 | 90.6 | 83.8 | 0.0 | 0.0 | 0.0 | 100.0 | 80.0 | 78.6 | 0.0 | 93.8 | 84.1 | 83.3 | 80.0 | 85.6 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18-19 | 78.7 | 81.0 | 76.9 | 0.0 | 100.0 | 0.0 | 65.4 | 0.0 | 73.2 | 0.0 | 61.1 | 80.0 | 87.5 | 85.2 | 73.8 |
| 19-20 | 79.8 | 79.2 | 79.4 | 0.0 | 100.0 | 0.0 | 84.2 | 50.0 | 77.4 | 0.0 | 85.7 | 80.3 | 82.6 | 81.5 | 80.3 |
| 20-21 | 78.5 | 78.8 | 77.9 | 66.7 | 91.7 | 0.0 | 90.5 | 53.8 | 68.3 | 0.0 | 0.0 | 82.1 | 100.0 | 68.8 | 75.6 |

*Table 2: Student Success Rates*

For any success rate that is not calculated, the total for that column is also not calculated.

1. Face-Face Modality Success rate (Modality)- 2020-2021 data are remote Modality only
2. Female Success rate (Gender)
3. Male Success rate (Gender)
4. Nonbinary Success rate (Gender)
5. Unknown Success rate (Gender)
6. Native American Success rate (Race)
7. Asian Success rate (Race)
8. Black Success rate (Race)
9. Latinx Success rate (Race)
10. NHoPI Success rate (Race)
11. International Success rate (Race)
12. White Success rate (Race)
13. Multiracial Success rate (Race)
14. Unknown success rate (Race)
15. Pell Grant Success rate (Financial Aid)

**Percentage Success by Course and Modality**

The ENGR SAC will be tracking ENGR 101 (*Table 2*). ENGR 101 has only been offered as a face-to-face course until the pandemic of 2020. The 2020-21 data during the pandemic, is remote only. The ENGR SAC will not compare the success rates during this time because of the additional factors during the pandemic that influenced students ability to learn.

**2B1a. Are there any courses with lower or higher pass rates than others (over time, over many sections, or a notably higher or lower rate)? If so, which ones?**

The ENGR 101 gateway course, over the past five years, has an overall lower success rate (Table 3) than the 200 level courses.

| ENGR | 2020-21 | 2019-20 | 2018-19 | 2017-18 | 2016-17 | Average |
|---|---|---|---|---|---|---|
| 101 | 78.5 | 79.8 | 78.7 | 85.0 | 88.0 | 82.0 |
| 223 | 82.9 | 94.7 | 92.5 | 96.8 | 100.0 | 93.4 |
| 226 | 92.9 | 100.0 | 96.3 | 90.0 | 100.0 | 95.8 |
| 231 | 91.3 | 88.5 | 92.0 | 86.7 | 96.0 | 90.9 |
| 262 | 95.8 | 92.0 | 95.9 | 96.6 | 96.7 | 95.4 |
| 271 | 93.3 | 92.0 | 100.0 | 94.1 | 96.0 | 95.1 |

*Table 3: Overall Course Success Rates*

An assumption could be made that the rate in upper-level course work is the result of the strength in the understanding of concepts and the acquisition of skills necessary for success in the discipline.

The ENGR SAC is observing the trends of ENGR 101. It is the foundational course requirement for all engineering students. After this course all specific degree options have different course pathways. It is impossible to compare

against pass rates for any of the other courses because Civil and Environmental Engineering, Chemical, Mechanical and Electrical Engineering students are all on different pathways.

**2B1b. Are there any modalities with lower or higher pass rates than others (over time, over many sections, or a notably higher or lower rate)? If so, which ones?**

The on-campus success rate over the past five years averages 83 percent, while the remote success rate of the past two years is at a lower rate of 78 percent. At this point in time, it is difficult to fairly gage if it is the use of modality or the extraordinary circumstances of our times. It should be noted that prior to 2020, over 98 percent of the program's courses were offered on-campus.

ENGR 101 is taught as a face-to-face course, except for during the pandemic. Up to about 2012 the course did have an offering via PCC TV where students could attend the course from various campus-based locations. There has not been, other than during the pandemic, any other modalities available for students to pursue ENGR 101.

**2B2. Strategy Insights**

**What strategies have you used to maintain high success rates? What can be learned that might be applied to courses with lower success rates? What are possible actions to be taken to understand/address lower success rates? Please clearly explain how your discipline intends to explore content/curriculum, pedagogy/teaching, course material selection, etc. using culturally responsive teaching approaches throughout the next year. Try to identify a realistic one-year goal.**

**What strategies have you used to maintain high success rates? What can be learned that might be applied to courses with lower success rates? What are possible actions to be taken to understand/address lower success rates?**

To be transparent, the ENGR SAC has not, in the past, taken many steps with regards to maintaining high success rates, addressing lower success rates, and have not taken actions in the past to understand or address lower success rates.

**Please clearly explain how your discipline intends to explore content/curriculum, pedagogy/teaching, course material selection, etc. using culturally responsive teaching approaches throughout the next year. Try to identify a realistic one-year goal.**

Please see Section 2A2.

**Enrollment and Percentage Passing by Course and Student Demographics**

Please see Table 2 in Section 2B

**2B3. The data may indicate a pattern of inequities (in gender, race, or Pell eligibility) in student enrollment or success. Please clearly explain how your program intends to explore content/curriculum, pedagogy/teaching, course material selection, etc. using culturally responsive teaching approaches throughout the next year. Try to identify a realistic one-year goal.**

If SVS training is a possible strategy, the ENGR SAC requests more information on the need of such training. There are two important questions: How many students need additional SVS training and are underrepresented students part of those students that need additional SVS training?

The target testing could be performed in Spring 2022. During winter quarter the SVS test can be purchased and a plan on how the SVS test would be delivered can be agreed on, e.g., as an online form or a .pdf document to be scanned and submitted. In Spring quarter all students enrolled in ENGR 101 would be required to take the test in the first lab class. Names (G#) and scores would be used for analysis of two target intentions: 1) Are there students in need of additional spatial training and 2) what percentage of those students are underrepresented students? Answering these questions will determine if an investment into the SVS system from students at PCC should be considered.

**2B4. What support does your SAC need to fully explore inequities in enrollment or student success? For example, are there any other data reports you would find useful to have related to student success?**

Please see section 2A2.

## SECTION 3: REFLECTION ON ASSESSMENT OF STUDENT LEARNING

**3A. Assessment Reports**

Please note: The following questions link directly to your Annual Learning Assessment Reports for the Learning Assessment Council. Feel free to cut and paste between this document and your other assessment documentation.

**3A1. Which student learning outcomes from your SAC's available courses will you assess this year, and will you use direct assessment strategies?**
***(These can be larger, program-level outcomes or course-level outcomes from your CCOGs).***

- Apply basic principles of mechanics and vector algebra in solving statics problems.
- Apply basic spreadsheet skills in solving statistics and engineering problems.

**3A2. Which courses do you plan to assess this year; how and why will your SAC choose the sections?**

ENGR 101, Engineering Fundamentals, is the gateway entry level course to this discipline and a required course common to all students entering the field of engineering. This course will be the focus of assessment as it is the prerequisite for most courses offered in this program.

**3A3. In general terms, describe the assessment project for the year from implementation to data collection. What steps will you take in carrying out the project?**

- Download ENGR 101 Enrollment Data from 2016 to 2021
- Analyze ENGR 101 Enrollment Data from 2016 to 2021
- Formulate Action Questions for SAC to pursue
- Pilot changes to SAC procedures and the ENGR101 course
- Assess change effectiveness

**3B. Response to LAC Assessment Question**

Please respond to the question below, which relates to your SAC's 2020-2021 Learning Assessment Report to the Learning Assessment Council (LAC).

**Commendations**: the SAC deserves credit for devising an innovative, and simple, solution to the cheating issue that appears to have yielded positive results on its first attempt. The project was well-designed to assess the outcome with a control and experimental group. The SAC is to be commended for carrying out the assessment in spite of the limitations during this pandemic year.

**Suggestions**: select a learning outcome at either the course or program level and make it the focus of the SAC's next assessment project in the 2021 - 2022 academic year.

**Question**: what learning outcome would be most useful as the basis of an assessment project moving forward? It's important to bear in mind that the purpose of the assessment requirement at the college is not just to fulfill accreditation requirements, but to help each discipline improve its work on behalf of students.

SAC Response: The SAC will focus on ENGR101 and course level outcome #4: Apply basic principles of mechanics and vector algebra in solving statics problems.

## SECTION 4: ADDITIONAL ACHIEVEMENTS, CHALLENGES or OPPORTUNITIES

**4A. Is there anything further you would like to share about your program's achievements at this time?**

The ENGR SAC is looking forward to continuing this assessment work in progress and accomplishing its identified goals in the coming years.

**4B. Are there any challenges not described above that you would like to note here?**

Tracking course to course success data in ENGR is problematic for a number of reasons:

- There are many ENGR "majors" (Electrical, Mechanical, Civil, Chemical, Environmental, Renewable) that students pursue. Each "major" has different course requirements.
- There are three principal transfer partners and multiple additional schools that students transfer to. Each 4-year engineering program has different requirements (Portland State, Oregon State, Oregon Institute of Technology)
- Students transfer after completing a varying number of courses. Some students only take a couple ENGR courses, other students take two full years of full time ENGR courses.

**4C. Do you see any opportunities in the near or long term that you would like to share?**

ENGR Faculty spoke with CIS faculty about a professional development opportunity through the University of Virginia called Lighthouse CC. CIS faculty found the workshop useful and the Lighthouse CC program could be a course attended by ENGR faculty. Funding is needed to join the program. Link to the Lighthouse CC project:

http://www.cs.virginia.edu/~cohoon/lighthouse/. The lighthouse program starts in October and the project was awarded additional grant funding in October 2021. Application: Lighthouse CC Online Course Application.

ENGR faculty are participating in the Persistence Project with leadership from the department's Dean. The four pillars of the persistence project are:

1. Learn the names of students.
2. Conduct a one-on-one meeting with each student.
3. Present requirements clearly stated in the syllabus that set high academic standards.
4. Give students early meaningful feedback.

ENGR faculty in the Persistence Project will implement their changes to Winter 2022 courses.

One ENGR faculty member is participating in the Racial Equity Leadership Academy for STEM Faculty Leaders Institute through the University of Southern California's Race and Equity Center. Application information: https://www.relaforstem.com