

Physics/Engineering
DEPARTMENT & PROGRAM REVIEW (2024)

To better align academic and operational reviews, Academic Program Reviews (APR) and Administrative Unit Reviews (AUR) are now known as Department & Program Reviews (DPR).

Section 1: Report on Previous Goals & Requests

Please limit your response to 250 or fewer words.

- i. Improve retention from GE101 (GE101 students go on to declare engineering as major)
 - a. Engineering numbers dropped off during the pandemic but are starting to pick back up again. See Table 2.
- ii. Facilitate internship opportunities.
 - a. We are always encouraging students to find internships and make connections to students with our engineering networks. We also facilitated a MECOP – Multiple Engineering Cooperative Program presentation the past three years with different industry partners. We just learned this year that the OSU-Cascades ESE degree program was dropped off the MECOP list due to its current size and course schedule.
- iii. Increase Project based learning opportunities.
 - a. ENGR 211 bridge kit, ENGR 213 hands on projects, PHYS 213 projects, GS 107 projects
- iv. While Covid reduced class sizes, it also made hosting an open science night for the PH 213 projects difficult. We hope as enrollment continues to increase post-Covid this tradition will also start back up, as it was a great way to get people onto campus and more familiar with our science department and students. Incorporate more technology into physics learning: Vpython, Arduino/microcontroller processors, 3D printers, etc.
- v. We purchased three 3D printers and hired an instructor for the first ENGR 102 course but the class was cancelled this year due to instructor health issues. Expand and support SoTL and other research-based reform projects. The number of campuses participating is growing and COCC has potential to be at the forefront of a major shift in the role of community college professors in the state of Oregon.
 - a. The SoTL project has expanded to include not just math and science professors, but professors from many different disciplines and departments. The project is also now housed under the Teaching and Learning Center, making it more widely available to all faculty who want to participate. Covid stalled efforts to connect more to other campuses, but post Covid, there is momentum growing at LCC and LBCC to start working together to build a broader network of community college professors across the state engaged in the Scholarship of Teaching and Learning.
- vi. Resolve scheduling conflicts between the Solidworks class offered by CIS during the winter term and Engr 201.
 - a. Solidworks is now an online class so the scheduling conflicts went away. We are transitioning to ENGR 102 to replace Solidworks but due to the instructor issue

mentioned above, the CIS department added a section of Solidworks in the spring to meet our demands.

- vii. Improve schedule synergy with OSU Cascades on lower division engineering and physics classes.
 - a. This is a work in progress and we continually adjust schedules here and there to align with OSU and make sure our students aren't missing any courses due to scheduling conflicts. Currently there is an OSU course ST 314 in the spring conflicting with our ENGR 202 lab but that we will try to resolve in the future but students can take ST 314 in the summer so they aren't completely out of luck. They need this class for their first fall term at OSU-C.
 - viii. Brainstorm ways to better support students in their transition to the rigorous, highly competitive bachelors and graduate programs they planning to attend. How can we build their confidence, encourage patience and persistence, and prepare them for the professional cultures they will be engaged in?
 - a. Ongoing work and continued conversations with OSU-Cascades engineering team Research in physics education shows that addressing students' epistemological beliefs about learning and doing physics not only helps increase their conceptual understanding and problem solving in physics, but also has a positive effect on science identity and confidence. Wendi has been incorporating regular conversations in PH 211 – 213 about learning to help her students reframe their experiences in the classroom and address these beliefs and expectations. A major goal is normalizing the struggle of wiring one's brain to build physics and engineering models, and patience and persistence are a key part of this conversation.
- a. Needed Support**
- i. Instructor Resources. Engineering is very broad and finding someone who can teach all the engineering coursework is very difficult.
 - ii. ENGR 102 is a case in point. We could use a mechanical engineer to help grow the program. Finding qualified part-time engineering instructors is especially difficult during times of high employment.
 - a. Another reason a mechanical engineer position could be warranted.
 - iii. Servicing north campus classes and engineering classes spreads instructors thin between general science and core physics and engineering classes.
 - iv. Greater funding for faculty participation and travel to conferences (\$4,000 instead of \$24,000)
 - a. Nothing has changed here but we have been able to tap into additional PIP funding.

Section 2: Fulfilling Your Mission

Please limit your response to 500 or fewer words.

To prepare students to transfer to and successfully complete a 4-year STEM degree. In addition to completion of a 4-year STEM degree, successful students should be able to show competency by passing exams such as the Fundamentals of Engineering (FE) or Medical College Admission Test (MCAT).

Our students continue to achieve success after leaving COCC both in finishing their B.S. in engineering degrees as well as passing the FE exam. It is inspiring to run into students around town working in the

field of engineering after beginning their education at COCC. We have several students that started at COCC, completed their undergraduate degree in engineering, and are now working in industry sharing their experiences with our ENGR 100 students including Kevin Barnett from Eaton, Scott Mellinger from Deschutes Brewery, Austin Steimer from Earth Cruiser, Paul Norman and Michael Levitt from Colebreit, Brandon Luzier from Froelich.

Section 3: College Goals and Initiatives

Please limit your response to 500 or fewer words.

The engineering program shares many values with the college including engaging our communities, achieving excellence, embracing environmental sustainability and fostering communication.

Our ENGR 100, Engineering Orientation course, connects and collaborates with our engineering community partners, many of which were former COCC engineering students. We have many engineering guest-lectures and field trips to engineering firms including Deschutes Brewery, Hydroflask, Earth Cruiser, Froelich Engineering, Colebreit Engineering, Thermo Fisher, Lonza, Eaton Power Systems, Department of Energy and many more.

Our engineering relationship with OSU-Cascades has been stronger in the past but we are attempting to rekindle that relationship. We have reached out to the program leads and have suggested a social get together in the spring to get to know each other better and to discuss strengths/weaknesses that they are seeing in our engineering student's skills as they move through their junior and senior years at OSU-Cascades.

Section 4: Diversity and Inclusion Insights

Please limit your response to 500 or fewer words.

Anti-racist pedagogy

Kevin joined the anti-racist assessment practices group that convened in the Fall term of 2021. They met three times over the course of the term, had many good discussions, and shared our work with our colleagues. Kevin decided to focus my project on qualitative assessment that he performs in many classes on a regular basis. As he works through engineering problem solving examples, he consistently asks questions of the class to roughly gage their understanding of the material. It is a way for him to assess their progress and hopefully a way for them to assess themselves as well. He noticed over the years that he often has 2-3 strong voices that tend to answer his questions the majority of the time. Kevin has done many things over the years to get more engagement from a wider population. Things like 'think, pair, share' are great ways to engage introverts, extroverts and the entire class in the learning process. He explored and researched using techniques like popsicle sticks with student names

to call out on a specific person, clickers, and kahoot. Kevin ended up using clickers during an in-class quiz session to gauge student assessment and found the entire process and workshop to be insightful and a valuable learning exercise. These are all hands-on/bridge projects which equal high impact practices focusing on collaboration.

Table 1. shows the BILAPLOC data for the ENGR/PHYS program numbers. These departments have always been heavily skewed toward white male populations and continue to be. Table 4. Shows female numbers for the calculus-based physics sequence as well as for the engineering sophomore core sequence. While we are losing females in the physics sequence it is at a similar loss rate (about 50%) as the entire population. Looking at the Engineering sophomore numbers; females are succeeding and are almost entirely successful at completion once they get to that level.

Section 5: Strengths and Accomplishments

Please limit your response to 500 or fewer words.

Kevin was successful at co-chairing the International Snow Science Workshop (ISSW) that was a 4-year project culminating with a week-long conference held at the Riverhouse in Bend this past October. There were 1100 snow science, engineering and avalanche professionals from all over the world in Bend for a week 'Merging Theory and Practice' among the community. Several engineering students from COCC and OSU were able to attend a portion of the conference for free.

This program book outlines the event. Kevin and Zoe Roy (the other conference co-chair) managed, along with their contract conference partners International Conference Services out of Vancouver, B.C., a \$1 million budget and garnered net proceeds of \$150k that will be donated to the Central Oregon Avalanche Center along with other entities in the snow and avalanche industry.

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Wendi continued to be engaged in the Oregon chapter of the American Association of Physics Teachers (ORAAPT). In 2023 she hosted the fall meeting at COCC, which was a great chance to connect other physics professors and teachers from all over the state to our program and facilities.

From our last APR: Of the COCC students that have transferred to the OSU ESE degree between Fall 2010-Spring 2017, 50/51 students graduated and 48/51 got jobs. Also, the fundamentals of engineering exam, or FE, is the first exam students take close to graduation before becoming a professional engineer. This exam is a full-day exam that tests students on all coursework completed in their bachelor's degree programs, including all pre-engineering coursework. The data that OSU-Cascades has collected shows that 21/22 of the COCC students that transferred into the OSU-C ESE degree have passed the FE exam. This 95% pass rate is outstanding compared to national average pass rates of the FE exam that range from 60-75% depending on the specific engineering discipline. It has been more challenging to track these numbers more recently due to the pandemic and the retirement of Robin Feuerbacher, who we worked and collaborated very closely with at OSU but we assume the overall trends and pass rates for both graduation and the FE exam are at a similar high standard.

We also successfully searched for and hired Lexi Constantino to replace Bruce Emerson. Lexi has been managing the PH 201/202/203 sequence as well as filling in for some engineering and general science courses.

Section 6: Challenges

Please limit your response to 500 words.

Everyone struggled to accept, adapt, and overcome the COVID-19 pandemic. We are all happy to be on the tail end and are starting to see numbers rising again in all ENGR/PHYS courses (Table 1) and in the GE101/ENGR100 engineering pipeline course (Table 2).

Finding competent folks to teach part-time engineering courses is challenging.

Section 7: New Goals

List your goals and needs here. Include no more than five goals and indicate where/how you see these goals aligning with and/or positively impacting the current strategic plan or other important initiatives.

- For each goal, you may also indicate your timeline for making progress and/or achieving the goal before the next DPR cycle.

Goal 1: Hire a Mechanical Engineering professor

To meet the needs of ENGR 102 as well as to have a second engineer within the department with a different background, experiences, expertise, and skills than our existing group. Engineering is such a broad field covering so many different topics that it is tough to cover all basis for our student interests. The majority of our students major in ESE, which has a strong Mechanical Engineering component as well as ME.

Goal 2: Find instructor to develop/instruct ENGR 102 course

Goal 3: Articulate agreements with OSU for ENGR 100, 102, and 103 courses.

Goal 4: More astronomy courses!

With 2 local areas designated as Dark Sky Places, multiple observatories (with new on the way!), we should take advantage and offer more astronomy courses. Many schools offer a sort of year long sequence (ASTR 121 – 123 at UofO, PH 205, 206, and 207 at OSU, PH 121 and 122 at PSU): The solar system, stellar evolution, galaxies and the universe.

Goal 5: More lower lever physics courses

There have been talks between the Oregon State Physics department and the big community college professors at our conferences about the possibility of offering a few lower-level classes as 200 level instead of 300 level. There is currently a course at LBCC listed as PH 265 (Scientific computing) that may be counted at OSU for PH 365. I was there for discussion about the possibility of PH 315 (Physics of Contemporary Challenges – required at the end of year 2 in program) and PH 335 (Techniques of Theoretical Mechanics) as 200 levels of the same course, but there would need to be discussion about this. [Lexi could teach these!]

Another popular course in the past at LBCC has been an option 1 – 3 credit PH 299 Special topics: modern physics course. This included a field trip up to central Washington to go to Hanford Reactor and LIGO. There is interest in starting this back up with the potential for a multi-school field trip.

University of Oregon also offers a variety of 100 level physics courses (physics of sound and music, light color and vision, quantum mechanics for everyone, etc) that could be fun to explore.

Goal 6: Increase awareness of engineering program at COCC in the central Oregon area in help increase enrollment.

Section 8: Resource Needs

For each goal listed in Section 7, indicate what kind of resources, strategies, or support you need to achieve your stated objectives. The DPR Response team will review these requests and recommend the next step as appropriate in their written response.

Goal 1: Engineering is a booming field and there are a shortage of engineers in industry. A mechanical engineer would help round out Kevin’s Civil and Chemical backgrounds along with our core physics expertise with Wendi and Lexi. While the current FTE numbers don’t add up to needing a FT faculty member in this department, the right person could help grow the program to make the FTE numbers pencil out.

Goal 2: Our freshman engineering pipeline sequence is key to attracting students as well as keeping them in the engineering program. This past year we saw the challenges of finding part-time instructors to cover critical courses, like ENGR 102. This course has not been offered in the past and is needed to keep up with our industry partners as well as align our curriculum with OSU and other four-year institutions. A mechanical engineer would be perfectly suited to develop this course and help build a stronger engineering program.

Goal 3: We began initial conversation with Nick about this a year ago but decided to hold out until the ENGR 102 course had been built and developed. We were hoping this would happen this year but will need to wait until next year to continue these efforts.

Goal 4: We have Bob Grossfeld here as an adjunct professor wanting to expand the curriculum options. We would need marketing and community outreach to bolster interest, and likely some articulation agreements with local colleges for transferability.

Appendix:



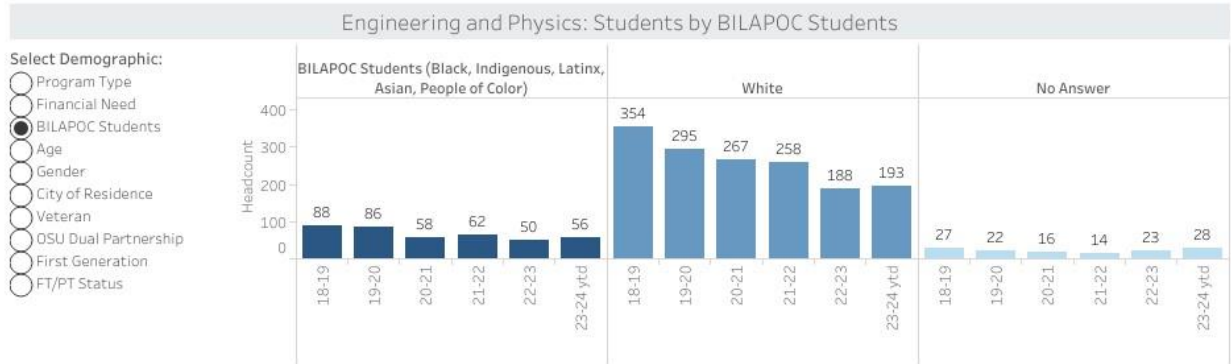
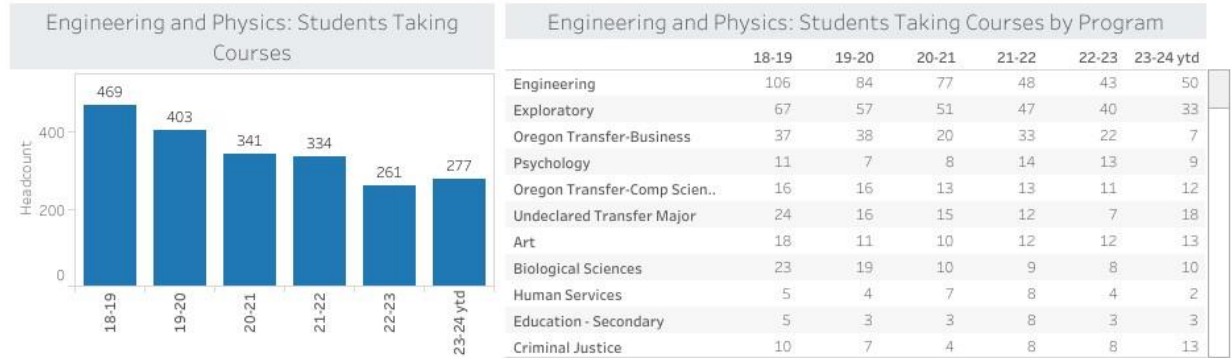
Students Enrolled in Discipline Courses

Examines all students enrolled in courses regardless of major.

Data Updated:
3/19/2024

[Tutorial](#)

Select Term or Annual: Annual Select Discipline: Engineering and Physics Select Subject: All Select Course: All Exclude College Now: Exclude College Now



BILAPOC Students Broken out by Race/Ethnicity

Students are unduplicated within a category, but could be duplicated between categories. Example, if a student is Hispanic and Native American, they are counted once in both categories.

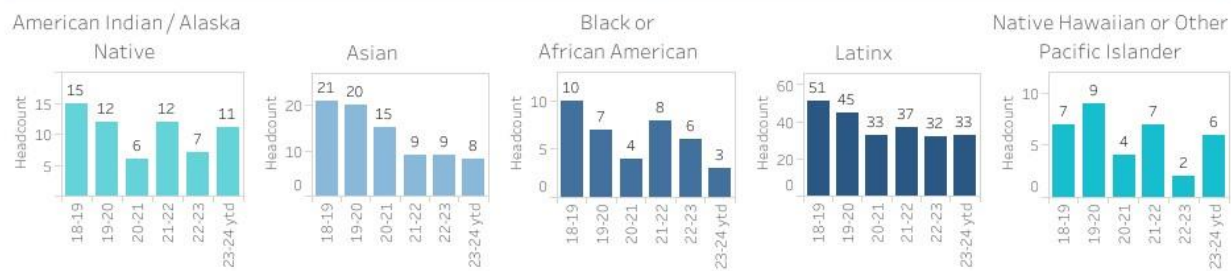
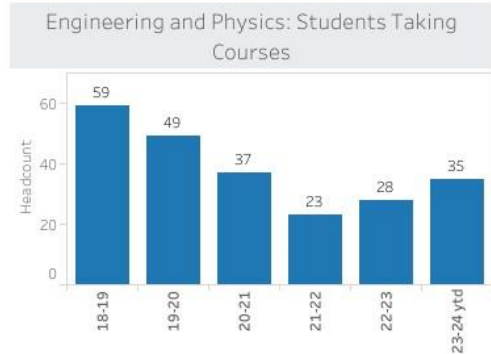


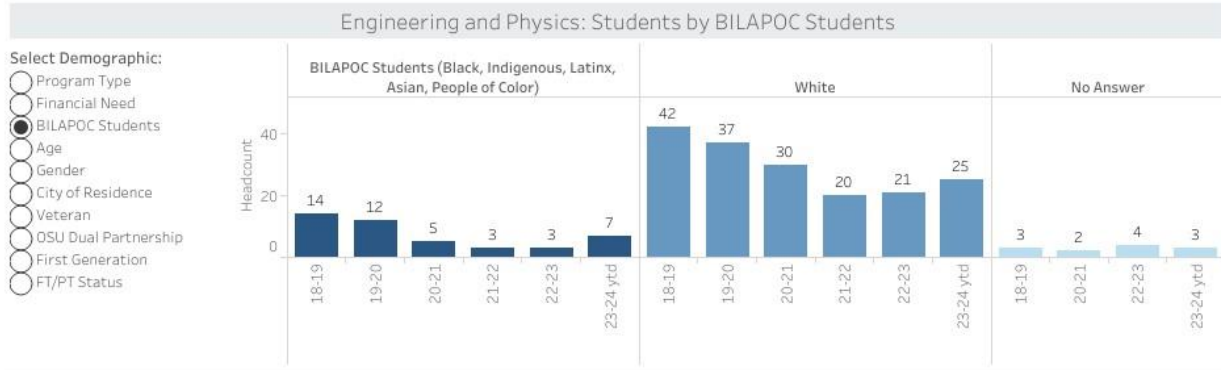
Table 1. All ENGR/PHYS

Select Term or Annual: Annual Select Discipline: Engineering and Physics Select Subject: All Select Course: Multiple values Exclude College Now: Exclude College Now



Engineering and Physics: Students Taking Courses by Program

	18-19	19-20	20-21	21-22	22-23	23-24 ytd
Engineering	49	37	26	19	20	28
Oregon Transfer-Business				1	1	
Mathematics	1			1	1	
Exploratory	3	4	4	1		2
Accounting				1		
Welding	2					
Undeclared Transfer Major	3	1				
Pre-Med/Veterinary/Dentist..						1
Physics		1	3		1	
Oregon Transfer-Comp Scien..						1
Not Seeking a Degree		1			2	



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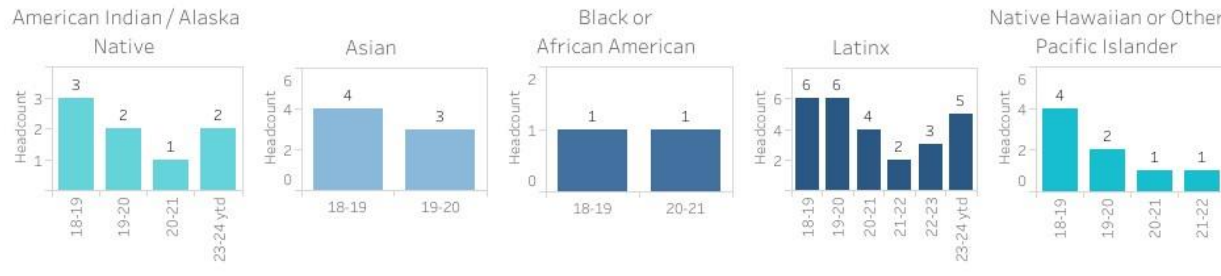


Table 2. GE 101 and ENGR 100 (Pipeline feeding ENGR program)

18-19	19-20	20-21	21-22	22-23	23-24	Course
59	49	37	23	28	35	GE 101/ENGR 100
68	51	38	31	23	32	PHYS 211
48	19	42	20	18	15	PHYS 212
39	28	24	17	13	8	PHYS 213
23	22	19	16	12	13	ENGR 211
26	15	22	17	12	13	ENGR 212
25	20	31	20	14	10	ENGR 201
65	59	53	37	27	31	PHYS 201
33	28	17	10	16	17	PHYS 202
29	21	15	6	10	12	PHYS 203

Table 3. ENGR/PHYS course numbers

18-19	19-20	20-21	21-22	22-23	23-24	Course
16	12	11	7	3	8	PHYS 211
8	4	10	4	4	5	PHYS 212
9	5	5	0	3	1	PHYS 213
4	4	3	1	3	1	ENGR 211
5	5	3	1	3	1	ENGR 212
3	4	3	1	2	1	ENGR 201

Table 4. ENGR/PHYS Female numbers