

## New Academic Program: Bachelor of Science in Engineering Science

### BACKGROUND

#### Program Proposed Start Date

Fall 2020

#### Program Description

The new degree program proposed is a Bachelor of Science (BS) in Engineering Science.

OSU-Cascades is proposing a BS in Engineering Science that provides students with a strong, broad foundation in engineering fundamentals rather than in a specific engineering discipline. The program will prepare students to be engineers while not confining them to a single discipline therefore addressing the emerging need for dynamic, agile, and flexible engineers. The Engineering Science program will be housed in the College of Engineering. The program will be offered at the OSU-Cascades campus in Bend.

The curriculum will have a common core built from select courses across several engineering disciplines (industrial, electrical, and mechanical) as well as the required science and mathematics courses. Discipline-specific technical electives will be offered, allowing a student either to gain exposure to several different fields by taking an assortment of those courses, or to specialize in a particular area by taking technical electives focused in one concentration. This program would complement the existing Energy Systems Engineering program at OSU-Cascades.

The Engineering Science curriculum falls under the Accreditation Board for Engineering and Technology (ABET) general criteria for baccalaureate level programs. ABET guidelines and standards were used to guide the development of this program, including experiential learning. ABET program eligibility requirements indicate a program must have one graduate before requesting an initial accreditation review. Based on the proposed timeline, a review could be requested in 2024.

#### Program Context

An engineering program must prepare students for not only today's technological and societal challenges but also those of the future. These challenges are becoming increasingly complex as well as multidisciplinary in nature. An investigation of similar programs at peer and aspirational peer institutions was performed and their curriculum used as a model. Some of the top engineering schools in the country (e.g. Harvey Mudd College and Olin College) offer similar programs. Additionally, Pennsylvania State University, also a land, space, sun, and sea grant designated campus, offers an engineering science program as part of its honors college.

The first two years of the program include courses that can be taken at OSU-Cascades or at a community college. The second two years must be taken at OSU-Cascades. Following the same academic progression model used by many of the other schools in the College of Engineering, continued enrollment in the program will be based on cumulative OSU GPA and successful course completion rate.

The proposed curriculum for the four-year BS in Engineering Science degree includes 82 credit hours in the major with 61 credit hours at the upper division. In the proposed curriculum, every term requires a minimum of 12 credit hours, ensuring full-time status for students receiving financial aid. The proposed program is composed of forty-five classes that are already offered at OSU-Cascades (baccalaureate core, general engineering, mechanical engineering, electrical engineering, industrial engineering, math, science, and business), four new offerings, and three courses and a lab offered already in Corvallis, but not yet offered at OSU-Cascades.

The launching of the BS in Engineering Science will correspond with the opening of Academic Building 2 (AB2) on the OSU-Cascades campus — a building that will be focused on Science, Technology, Engineering, Arts, and Math (STEAM). Much of AB2 has been dedicated to the support of this program including a machine shop, maker space, teaching laboratory space, faculty offices, student study spaces, and classrooms.

### **Program Purpose/Relationship to University Mission and Strategic Plan**

The addition of the Engineering Science program would be in strong alignment with Oregon State University's commitment to providing access to education and continued focus on serving students in Central Oregon. Because today's technological and societal challenges are becoming increasingly complex and multidisciplinary in nature, the Engineering Science program will provide students with a strong, broad foundation in engineering fundamentals rather than in a specific engineering discipline, providing students with the solid background required to contribute to any of the three Signature Areas identified in the OSU strategic plan. For example, through their training in electrical fundamentals, electronics, and energy distribution, a student in Engineering Science could work as a power engineer for a wind turbine company, addressing Advancing Science in Sustainable Earth Ecosystems. A student taking engineering graphics, material science, and capstone design could be employed in the medical device field, addressing Improving Human Health and Wellness. Historically engineers have been Promoting Economic Growth and Social Progress, so students of this program would be well-positioned to continue doing so.

### **Need for the Program**

The Bend-Redmond metropolitan area was the third-fastest-growing area of its kind from July 2015 to July 2016. Providing a strong engineering program in the rapidly growing Central Oregon region is directly in line with the OSU goal to be a "major contributor to the vitality of the unique Central Oregon community and environment."

Only three of the seven public institutions of higher education in Oregon offer engineering programs. None of those institutions currently offers an engineering science (or similar) program. The ability to customize, as well as the flexibility of this program, will appeal to the educational needs of current and future students. The BS in Engineering Science at OSU-Cascades both serves students in Central Oregon and provides an additional option for the entire engineering student body at OSU. The program at OSU-Cascades will be attractive to those students seeking a broad engineering foundation while still having the opportunity to build specific expertise in an area of concentration.

Two national databases indicate a 6% employment growth rate in general engineering. From 2014 to 2015, the number of Bachelor of Science degrees awarded from an engineering program grew by 7.5%, an upward trend that started in 2007. The Bureau of Labor Statistics projects employment of mechanical engineers will grow by 5% from 2014 to 2024 while that of electrical and industrial engineers will hold steady. Anecdotal evidence indicates technology companies are bracing for the 'silver tsunami,' as a large portion of their workforce is preparing

to retire and the supply for replacements is low, especially in engineering. All these facts indicate strong demand for engineers and that the addition of an engineering program is not likely to affect enrollment in existing programs.

**Program Financials**

**Projected Enrollments:** The OSU-Cascades Energy Systems Engineering (ESE) Program was established in 2010. It is the only engineering program of its kind offered in the state of Oregon and one of six accredited programs in the country. The program has had strong enrollment growth as demonstrated by the graduation numbers increasing from 12 students in 2013 to 23 in 2019. Enrollment trends comparable to that of the Energy Systems Engineering Program are expected in Engineering Science with 10 enrolled in the program in 2020 and 80 by 2024. At maturity, we anticipate 20 graduates each year.

**Instructional Faculty and Support Staff:** There is significant overlap of courses between Energy Systems Engineering and Engineering Science in the first two years of each program. As such, the courses that overlap with the ESE program will be taught by the current ESE faculty: two instructors, one assistant professor, and one associate professor. These faculty all hold PhDs and have extensive industrial experience. With program implementation, the following staffing plan for engineering sciences is proposed:

- AY 2019 – 2020: Instructor (hired)
- AY 2021 – 2022: Above instructor and part-time faculty
- AY 2022 – 2023: Second Instructor
- AY 2023 – 2024: Two above instructors and part-time faculty
- Timing TBD: Two Tenure track professors

The instructor hire proposed for AY2020 will cover the new offerings needed to support the Engineering Science program. This individual is already on staff. As Engineering Science enrollment grows, ESE courses will be over capacity and additional sections will need to be offered. Some of these sections will be covered by part-time faculty. A second instructor is proposed in AY 2022 – 2023. As enrollments increase and there is a sense of disciplinary needs, two tenure track faculty in different engineering fields will be hired to ensure research in all program-based engineering disciplines is represented.

Part-time faculty will be used judiciously to enhance program offerings. In the past, the ESE program garnered very good accreditation reviews due to the use of excellent, well-experienced part-time faculty from the community. A similar approach will be employed by this program. Additionally, 0.33 FTE of an advisor will be added for every 100 students enrolled that will be provided by the central pool of advisors on the OSU-Cascades campus.

The budget is summarized in the table below.

	Academic Year 2020-21	Academic Year 2021-22	Academic Year 2022-23	Academic Year 2023-24
<b>Personnel</b>				
Faculty	\$68,500	\$76,698	\$175,573	\$190,866
Support staff (advisor)	0	0	\$14,985	\$15,435
OPE	\$35,760	\$46,706	\$107,873	\$117,607

Personnel Subtotal	\$105,525	\$124,697	\$301,071	\$326,603
<b>Other Resources</b>				
Library databases	0	0	0	0
Services & Supplies: office supplies, postage, lab supplies and equipment, professional development, new faculty computers	\$10,750	\$8,870	\$15,502	\$11,647
Other Resources Subtotal	\$10,750	\$8,870	\$15,502	\$11,647
<b>TOTAL COST OF PROGRAM</b>	<b>\$116,275</b>	<b>\$133,567</b>	<b>\$316,573</b>	<b>\$338,250</b>
<b>Resources</b>				
Current budget, unit			\$90,156	\$93,381
Tuition (OSU-Cascades)	\$128,052	\$175,857	\$226,417	\$244,869
<b>TOTAL RESOURCES</b>	<b>\$128,052</b>	<b>\$175,857</b>	<b>\$316,573</b>	<b>\$338,250</b>
<b>Difference</b>	<b>\$128,052</b>	<b>\$175,857</b>	<b>\$316,573</b>	<b>\$338,250</b>

**RECOMMENDATION**

All appropriate university committees and the OSU Faculty Senate have positively reviewed the proposed program. The Provost recommends that the Board approve the establishment of a Bachelor of Science in Engineering Science, effective fall 2020, pending the support of the Statewide Provosts Council and the approval of the Higher Education Coordinating Commission.