

# A School of Engineering for Cal Poly Humboldt

October 15, 2021

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## Introduction

With the work towards expanding engineering program offerings as part of the Humboldt State polytechnic transition, there is an opportunity to rethink how we organize and deliver engineering training for the 21st century.

We propose developing a School of Engineering with a student-focused structure that can support inclusive access to engineering education and foster interdisciplinary work.

The School of Engineering will be a home for five programs focused on *engineering of physical systems* that are anticipated for Fall 2023, and could grow to include more in the future. The five initial programs will include: our existing Environmental Resources Engineering B.S. degree, the existing M.S. Environmental Systems E.R.E. option, and three new programs: Energy Systems Engineering B.S., Mechanical Engineering B.S., and Engineering & Community Practice<sup>1</sup> M.Eng.

The three new programs are being newly developed for launch in 2023. The Engineering & Community Practice M.Eng, a one-year practice-based masters, is being developed and offered as an interdisciplinary collaboration between the Native American Studies department and

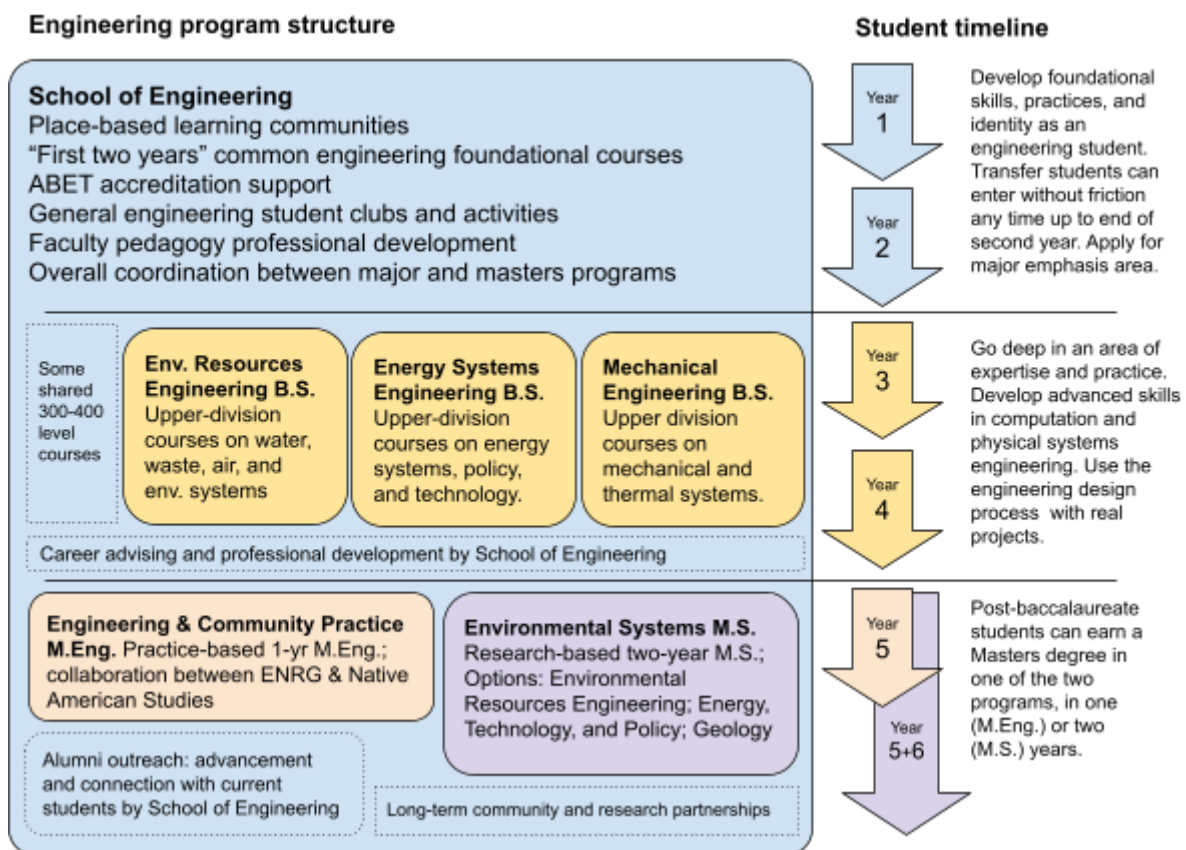
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<sup>1</sup> In the prospectus this program was renamed "Engineering Leadership." We anticipate continued deliberation and conversation to identify the final name.

engineering faculty. The other new programs, Energy Systems and Mechanical Engineering, are being developed by engineering faculty in consultation with others on campus.

## School of Engineering

Based on decades of experience in engineering education and insights from serving our students, we propose to structure the Engineering programs with a 2+2+1 framework (outlined below), housed within a **School of Engineering** that offers multiple degree programs. In our vision the first two years are common among all undergraduate engineering students and are transfer-friendly. The second two years go in depth in a specialty area along with maintaining some shared coursework and services. After the B.S., there is an option for a +1 (or +2) year masters at the end. This framework will be designed to ensure inclusive and equitable access to engineering majors, support seamless integration of transfer students, balance course enrollment, expose students to a wider diversity of methods, provide opportunities for valuable masters degrees, and allow a centralized design of the first-year experience and lower-division pedagogy that prepares students for success and balances course enrollment.



**Figure 1:** School of Engineering administrative structure and student experience



## Engineering Programs' Structure = 2+2+1

**General first two years: Engineering and computational foundations.** During these two years students will take a sequence of courses including introduction to engineering and design, statics and dynamics, physics, math, chemistry, and computational methods. These courses will be organized by a new "School of Engineering" that will be in charge of cross-departmental offerings including these "first two years" courses.

**Focused second two years: Major area of depth and practice.** Students will apply to matriculate into one of the major areas of focus and will spend two years completing a series of courses that are focused on the specifics of their chosen area. These will include advanced courses in engineering fundamentals (e.g., thermodynamics, hydrology, mechatronics), and several design-oriented elective courses to provide practical experience in applying engineering. All majors will culminate with an interdisciplinary Capstone Design experience that involves a client-focused project.

**Plus one final year for a Masters in Engineering:** All students who meet the enrollment requirements (TBD) for the masters program will have the option to complete one additional year of study to earn a *Masters in Engineering & Community Practice*. This practice-based degree program, offered through a partnership between the School of Engineering and Native American Studies department, will provide students with the support they need to better understand the context of their work as engineers and leaders. They will complete a yearlong applied design project that focuses on better meeting community needs in our region.

**Plus two years for a Masters of Science:** We will continue offering our two-year, research-based M.S. degree programs through the *Environmental Systems* program, with admission depending on student preparation and the availability of faculty to support their research and provide mentorship. There are two options areas of the Environmental Systems program that are supported by engineering faculty: Environmental Resources Engineering and the Energy Technology and Policy.

## Administrative Structure

Meeting the needs outlined above requires new thinking for how to structure engineering education. We cannot meet the goals with three or more siloed departments who only loosely organize their offerings. This would result in students being in silos as well, losing opportunities to engage with a range of perspectives and reducing the effectiveness of education. This integrative approach aligns well with the current thinking in Engineering Education. In order to solve "*wicked problems*" we need a new approach to engineering education. Our Vision for this approach is presented below.

The School of Engineering will be an organizing structure between the five physical systems Engineering programs (Environmental Resources, Energy Systems, Mechanical, Engineering &

Community Practice and Environmental Systems) as well, supporting common needs for accreditation support, career advising, clubs, etc.

**We propose that the Cal Poly Humboldt School of Engineering would initially be part of the College of Natural Resources and Sciences**, and be administered as a large department that offers multiple majors and masters programs. If the number of students and programs within the School become large enough, then the Cal Poly Humboldt College of Engineering could be proposed at a later date with departments representing each engineering program.

Based on this structure, **faculty appointments and hiring will be at the School of Engineering level**. (The specifics of faculty title are not yet conceived. Faculty may be known as Professors of Engineering, or may be known as Professors of Mechanical Engineering etc.)

## Staffing Needs

In order to have people in place to plan before the launch of the polytechnic programs, we recommend that administrative and technical staff support is provided for Fall 2023.

We recommend that there be the following faculty administrative support for the Cal Poly Humboldt School of Engineering:

- a **School Chair** for the School of Engineering with full buyout (15 WTU)
- faculty **Program Coordinators** (with buyout time) in each of the three B.S. programs and each of the two masters programs

We recommend that the following staff support the start up of the Cal Poly Humboldt School of Engineering. These positions *are in addition* to the current staff in the ERE department who we anticipate retaining.

- **Recruitment Coordinator** for the School of Engineering for at least five years.
- **Professional Advisor** dedicated to engineering - this advisor may focus on students in their first two years of the curriculum.
- **Analyst** to support accreditation and other program functions
- **Lab technician (2)** staff to assist with facilities scale-up and lab operations

## Vision for Engineering at Cal Poly Humboldt

We want to have Engineering programs at Cal Poly Humboldt that are consistent with the principles described in the Polytechnic Prospectus and our current programs' focus on student success. We would like to develop programs and the School of Engineering to emphasize several priorities, including:

- Develop **excellent fundamental skills** in technical and professional practices

- Use best practices in engineering education across the curriculum with active learning, project-based learning, and other proven STEM education strategies.
  - Provide a cohesive and continuously supportive program for professional skill development, including communication, teamwork, and collaboration
  - Incorporate inclusive and equitable practices into courses across the curriculum and nurture and maintain a professional School of Engineering culture that communicates in word and deed the importance of equity and inclusion.
- **Provide opportunity for authentic interdisciplinary practice and collaboration**
    - Facilitate collaboration across the engineering disciplines as well as disciplines outside of engineering with a focus on social and environmental justice.
    - Integrate indigenous sciences into the curriculum of the School of Engineering
- **Provide inclusive and equitable access** to engineering education to a diverse student population
    - Design all courses, but especially lower division courses, to meet the needs of all Cal Poly Humboldt engineering students. Rather than “weeding students out”, we will focus on “priming the pump” to make engineering accessible to a wider range of students. We will focus on meeting students where they are and with the assets they bring, rather than use a deficit model when working with our students.
    - Provide students an opportunity to choose their specific major after they have developed confidence in their knowledge, skills and abilities to be successful in engineering. This approach gives students who couldn’t picture themselves as a particular type of engineer a chance to form that intention.
    - Enable transfer students to enter after 1 or 2 years of focused work at the community college without slowing their progress to a four year degree.