

EARTH 'CYCLE

A popular course kicks mechanical engineering education into gear.

At the University of Pennsylvania, students are discovering the power of sustainability through something surprisingly old-school: the bicycle. Dustyn Roberts, associate professor of practice in mechanical engineering and applied mechanics, has turned her lifelong passion for cycling into a teaching tool that connects engineering fundamentals with environmental impact and community engagement.

Roberts's approach is grounded in the Engineering for One Planet (EOP) Framework, a set of learning objectives that a coalition of individuals from academia, nonprofits, government, and industry developed, with support from The Lemelson Foundation, to help faculty integrate sustainability into engineering courses. Roberts helped produce the framework. Now she uses it to guide students to see engineering not only as problem-solving, but also as a means to design for a more sustainable future.

Roberts was also part of the second cohort for the Engineering for One Planet Mini-Grant Program, which ASEE administers in partnership with The Lemelson Foundation. Since 2022, ASEE has identified and supported faculty like Roberts with curricular innovations. With 69 grantees over four annual cohorts, ASEE has been steadily helping to grow the community of sustainability-minded engineering professionals. Grantees meet regularly with mentors, participate in a nine-month-long Community of Practice, and share their curricular innovations each January in an online public symposium.

Roberts's Introduction to Mechanical Design class, a first-year course popular among both engineering majors and non-majors, has maintained its focus on mechanical design and fabrication while infusing sustainability into every aspect. Students track their own attitudes toward sustainability, learn digital tools that measure environmental impact, and cap the semester with a "design for disassembly" project—taking apart mass-produced products and proposing redesigns that encourage reuse rather than waste.

Building on that momentum, Roberts launched a new course—Bicycles: The Mechanical Advantage. First offered in 2024 and now expanded to include a spring trip to the Netherlands, the course blends history, mechanics, design, and service learning. Students volunteer at local bike shops and reclaim and repair bikes abandoned on campus, in partnership with Penn Police and mentored by professional mechanics. They then return the bicycles to the community.

The course also comes with a delicious twist. Students collaborate with high school partners to design and build smoothie bikes—stationary bicycles that blend fruit drinks with pedal power. Demonstrated at schools and community events, the projects spark curiosity in younger students while showing how engineering can be simultaneously fun, practical, and nourishing.

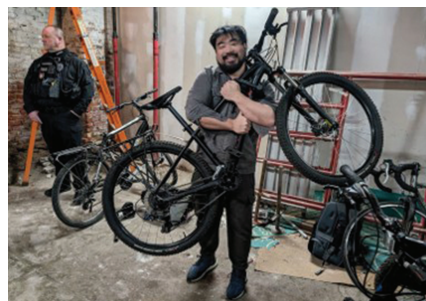
The results have been remarkable: the Bicycles course now receives three times more applications than available seats. Students from majors across the university are drawn not only to the mechanics of cycling but also the opportunity to align their education in engineering with values of sustainability and community impact.

As one student reflected about traveling to the Netherlands with the class: "I came home thinking less about the gears and mechanics of a bike and more about what it means to build a world that's truly people-first."

For Roberts, that shift in mindset is the true goal. Her classes show that the bicycle—unchanged in its essentials for nearly 150 years—can be a powerful vehicle for preparing engineers to design a more sustainable future.



Two local bike mechanics (left and right) with a student in the Bicycles class (center).



A Penn staff member retrieves an abandoned bike from storage with Penn Police.

A middle school student tries the smoothie bike at a school event.



Photos courtesy of Dustyn Roberts

Learn more at <https://engineeringforoneplanet.org> and <https://eop-mgp.asee.org>. Applications for Cohort V of the Mini-Grant Program open in November 2025. Cohort IV will offer a public, online symposium highlighting their projects in January 2026.