THE BRIDGE

Elevating engineering careers for tomorrow

CEE's professional master's programs merge the convenience of online learning with the richness of in-person interaction to prepare engineering's future leaders.

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FALL 2023

CIVIL & ENVIRONMENTAL ENGINEERING

UNIVERSITY *of* WASHINGTON

Drones n' Lasers

Workshop shows first-year students how to use LiDAR drone technology.

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MESSAGE FROM THE CHAIR

Welcome to the fall edition of *The Bridge*. I am excited to start my second year as CEE chair and to continue working with the CEE community to educate the next generation of civil and environmental engineers and pursue research that helps us prepare for a rapidly changing world.

As chair, my priorities for the coming year are increasing enrollment, strengthening ties with our external partners and implementing our strategic plan. I mentioned recruitment in the last two editions of *The Bridge* as well. The job market for civil and environmental engineers remains excellent and we need to increase enrollment to meet that demand. We are tackling this challenge in multiple ways, from streamlining prerequisites to telling more CEE stories to make our degrees visible on campus and beyond.

We need to do better in explaining the profession to prospective students. I look forward to working closely with CEE faculty Steve Muench and Alex Horner-Devine, who serve as the department's associate chairs of education and diversity, equity and inclusion, to spearhead our efforts in the upcoming year. Professor Anne Goodchild will also serve as an associate chair and will lead a new departmental committee focused on external engagement. With her help, I want to strengthen ties with our external partners, including alumni, industry, foundations and government. In all these activities, our strategic plan, which was completed last spring, will be our guide.

The feature story in this edition of *The Bridge* showcases our professional master's programs, both in-person and online. These programs provide engineers with additional skills that allow them to take on new and greater responsibilities in their place of work. The newsletter also provides updates on the activities of our student groups, such as the Steel Bridge and Concrete Canoe teams and our local chapter of Engineers Without Borders.

I would also like to take the opportunity to introduce a new faculty member in the hydrology and hydrodynamics research group, recognize a notable faculty retirement and celebrate promotions and honors.

Bart Nijssen
Chair & Professor

Faculty honors

Professor Yinhai Wang was among eight UW faculty elected into the Washington State Academy of Sciences. Wang was selected because of his "pioneering contributions to traffic sensing, transportation data science, edge AI, and smart infrastructure system theory and technologies, as well as the exceptional leadership in regional collaborations among academia, industry, and agencies for creating transformational mobility solutions."

Faculty member **Brett Maurer** was promoted from assistant professor to associate professor with tenure. His research focuses on geotechnical earthquake engineering, including soil liquefaction, hazard mitigation, seismic site characterization, machine learning, remote sensing and post-earthquake investigation.

Christie Hegermiller joins faculty

As a child on Long Island, Christie Hegermiller was captivated by the waves shaping the island's coasts. This early passion has now guided her to CEE, where she plans to collaborate with a range of experts and community stakeholders as she delves into the dynamic interplay of waves and coastal changes.

Hegermiller's research spans from global ocean basins to local beaches, seeking to comprehend every journey of a wave — from its wind-driven birth to its eventual interaction with our coastlines.

Reflecting on her love for the ocean and its power, Hegermiller says, "The ultimate goal of a lot of my research is coastal processes and coastal change. I'm also interested in working with local communities and other stakeholders to understand how their environments are changing over time."

Hegermiller earned her bachelor's degree from Boston College in environmental geosciences and a Ph.D. in ocean sciences from the University of California, Santa Cruz. She has held various postdoctoral appointments, with notable work on understanding how waves in the Pacific Ocean might change during the next century.

Hegermiller chose to join the UW due to the interdisciplinary nature of the Environmental Fluid Mechanics group, which collaborates with experts from the School of Oceanography and the Applied Physics Laboratory.

She is thrilled to return to the classroom and is eager to teach and inspire the next generation of engineers and scientists.

Mark Hallenbeck retires after 39 years

Mark Hallenbeck has retired after an impressive 39-year tenure at the University of Washington. For three decades, from 1993 to 2023, he led the Washington State Transportation Center (TRAC), an interdisciplinary research agency housed within CEE. During his time, Hallenbeck worked on numerous transformative transportation studies.

Hallenbeck was nationally recognized as an expert in several areas of transportation engineering, and many of his innovative systems have been implemented regionally and nationally. Much of his research involved collecting and analyzing data to describe the use and performance of different transportation systems.

Over the years, he was involved in initial research that led to the implementation of Washington state's incident response program, freeway management system, truck weigh station bypass program and many other state traveler information applications.

Beyond his research, Hallenbeck was an affiliate faculty member in CEE and the Urban Design and Planning department. His courses, covering topics like urban transportation planning and sustainable transportation, were known for their depth and engaging approach. He was a respected voice in transportation, and the media frequently sought his insights, valuing his candid and often humorous perspectives on complex issues.

Beginning at TRAC in 1984, Hallenbeck advanced from a senior research engineer to its director. A UW alumnus, he holds bachelor's and master's degrees in civil engineering. Though retired, he will remain connected to the CEE department through teaching in the professional master's programs.

Ryan Avery, a senior research engineer within TRAC, will serve as the UW-TRAC interim director until a new director has been found.

Getting to the next level of ENGINEERING

By Julia Davis

CEE's professional master's programs offer flexible options for many different fields.

The landscape of civil and environmental engineering is constantly evolving, driven by technological advancements and the pressing challenges of modern society. CEE offers a variety of professional master's degrees tailored to meet the needs of practicing engineers and related professionals looking to update their skills and knowledge.

The professional master's programs serve as an educational bridge between the UW and industry, making sure professionals stay up to date in their fields. These programs and courses are designed to keep professionals aware of new practices and technologies and cover topics from machine learning to climate change and community resilience to the latest construction materials and cold-region engineering techniques.

Professionals who want to pursue a master's degree while continuing to work full time can choose between an in-person or online format for their program. The in-person professional master's degrees offer hands-on experiences, allow students to engage directly with faculty and peers, and leverage the UW's state-of-the-art facilities and on-campus resources.

For those who require more flexibility due to work commitments or geographical constraints, CEE offers four professional master's degrees entirely online. They provide a comprehensive education in areas such as energy infrastructure, construction engineering, supply chain transportation and logistics, and sustainable transportation. These programs give students the freedom to complete coursework from virtually anywhere, offering an invaluable opportunity for professionals who cannot commit to in-person classes.

Here, we outline CEE's professional degree options, which can serve multiple objectives — from increasing competitiveness in the job market and advancing current careers to acting as a gateway to further academic pursuits, such as a Ph.D.

Mastering civil engineering on campus

More than half of CEE's professional master's degree students complete their degrees either partially or completely on campus.

The on-campus programs offer flexible options — students can choose between doing the program part-time while continuing to work or as a full-time graduate student. Many of the on-campus programs include some online class options mixed with in-person courses. With nearly 100 students currently enrolled in on-campus professional programs, it's evident that many students prefer to learn in a classroom.

"The on-campus program is nice because it allows students to experience the University of Washington community in a more tangible way, since they are coming to campus and interacting in a classroom," says Bryan Crockett, CEE's director of academic services.

Students entering these programs typically hail from STEM backgrounds, often with prior civil or environmental engineering education. However, the programs are inclusive, welcoming students from diverse STEM disciplines, including chemistry, biology and environmental science. Each program gives students the freedom to tailor their degree based on their interests and career aspirations.

The in-person master's programs span six specialty areas:

- **Construction, Energy and Sustainable Infrastructure:** This program readies students for careers in the construction sector, as well as planning, designing and constructing energy-related or sustainable infrastructure.
- **Environmental Engineering:** Addressing the pressing challenges of our environment, this program provides a comprehensive background in both traditional and emerging areas of environmental engineering, such as drinking water and wastewater treatment, air and water quality, remediation of contaminated sites and resource recovery.
- **Geotechnical Engineering:** CEE's geotechnical engineering program is one of the oldest in the United States and allows students to focus on many different areas of geotechnical engineering, like earthquake engineering, landslide hazards, soil mechanics and foundation engineering.
- **Hydrology & Hydrodynamics:** For those passionate about freshwater systems, this program offers a deep dive into the physical, chemical and biological intricacies of hydrology. Graduates pursue careers in diverse areas like water resources engineering, coastal engineering, environmental restoration and management, risk management and design of hydraulic systems.

- **Structural Engineering and Mechanics:** This program offers courses in topics like structural design, multi-hazard structural response, classical theory and advanced structural analysis techniques. In addition to the courses taught by CEE faculty, lots of courses in other engineering disciplines, applied mathematics, architecture and construction management are approved for the program, allowing students to tailor the degrees to meet their professional goals.
- **Transportation Engineering:** Students in this program have course options on a range of topics like intelligent transportation systems, transit system planning, transportation data analytics, travel demand forecasting, traffic systems operations, freight transportation, human factors and analytics methods in transportation, including AI and machine learning.

Study completely online

For those who want to earn a professional master's degree with the flexibility to complete courses from anywhere, CEE offers four fully online programs.

Navigating supply chain complexities

Supply Chain Transportation & Logistics online master's degree

In recent years, the importance of supply chains in global commerce has become undeniable. CEE's online Master of Supply Chain Transportation & Logistics (SCTL) program prepares students with the tools to tackle today's industry challenges and anticipate future demands.

Opposite page: CEE's in-person master's programs cover several specialty areas, including construction and sustainable infrastructure. This page: Julian Yamaura, who directs CEE's Construction Engineering online master's program, demonstrates a concrete test for students. Photos by University of Washington

Getting to the next level of

ENGINEERING (continued)

The curriculum focuses on advanced concepts in transportation and logistics that impact supply chain management and is split into four themes: data-driven decision-making, integration and collaboration, critical thinking and presentation skills.

Unlike other online master's programs, classes in the SCTL degree are aimed at simulating in-person lessons, as opposed to asynchronous instruction, where students access lessons at their own pace. The program begins with a three-day intensive in-person residency, which introduces students to the broad fields of logistics, freight transportation and supply chain management. Students then meet online and have much more interaction with other students in the program in their weekly classes.

"It's an online program but with a very high-touch feeling. [Most of] the classes are synchronous, so we have an instructor who is leading the class," program director Amelia Regan says. "We really emphasize the human connections between the students and their classmates, the students and the faculty and the many industry experts that contribute to the success of the program."

The program caters to early and mid-career supply chain professionals looking for the skills to qualify for higher-level management positions in the industry. Most students complete the program in two years, but there is flexibility for completion within a year.

Crafting tomorrow's transportation solutions

Sustainable Transportation online master's degree

CEE's online Master of Sustainable Transportation degree stands out as one of the few interdisciplinary programs in the country to bring a sustainability perspective to transportation systems policy and planning. The program covers traditional engineering topics but also brings in urban planning, city design, environmental science and public policy, granting students comprehensive insight into transportation dynamics for both people and freight.

The curriculum combines interdisciplinary subjects like livable communities, technology, environmental impacts, policy development, health and economics. Classes convene online in real-time once weekly during the evenings. Additionally, students undertake a year-long capstone project, applying their knowledge to practical transportation issues.

"We're focused on how our transportation system can be used to make our world better. For example, if you get people out of cars and into buses, there are positive health outcomes such as more walking and less air pollution," program director Edward McCormack says. "It's a program that trains people about how transportation interfaces with many aspects of our society and provides an opportunity for change."

The program has attracted a diverse set of students, from urban planners to engineers to attorneys, who want to get more involved in the transportation sector.

In essence, the program prepares individuals not just for career advancement but to change the future of transportation on a global scale.

Building the future of construction

Construction Engineering online master's degree

The online Master in Construction Engineering caters to professionals in the heavy construction industry. The program is a partnership between CEE and the construction management department in the College of Built Environments. It offers a mix of seven courses from each department. As a result, students receive a blend of construction management principles and technical engineering knowledge.

One of the program's goals is to meet the needs of those who might be moving up in the field and taking on more responsibility and management.

"We're teaching a combination of advanced construction engineering principles and a variety of project management techniques. The program also covers some of the latest advancements in infrastructure construction including utility and energy projects. We also make sure that students get adequate exposure to industry standard software," program director Julian Yamaura says.

The program also provides a high degree of flexibility because of the seasonal demands in the construction sector. Students can enroll in the program in any quarter, and the program structure is standardized and predictable, allowing students to plan out their entire degree from the beginning. Courses cover a wide range of topics, from pavement construction and utility construction to cost analysis and energy infrastructure.

A standout feature of the curriculum is its forward-looking approach. While it firmly grounds students in traditional civil engineering principles, it also equips them with skills and knowledge about emerging sectors like energy infrastructure. This prepares students for the future of engineering, ensuring they are market-ready and versatile.

The robust course offerings and the structure make this program ideal for those looking to further their career in the construction industry while balancing professional commitments.

Illuminating the energy landscape

Energy Infrastructure online master's degree

As global energy systems evolve with emerging technologies, CEE's Master in Energy Infrastructure remains at the forefront, making sure that those in the field can learn about the latest advancements and tackle future challenges.

The program emphasizes flexibility with its online and asynchronous format. Its instructional approach sets it apart from some of the other degree options. A significant portion of the curriculum is taught by professionals currently working in the industry, which allows students to gain real-world insights that they can immediately implement in their own fields.

The program's curriculum covers every aspect of energy infrastructure at all levels, from planning and design to construction and management. The curriculum also stands out because of its emphasis on multiple one-credit "focus courses" that students can take in conjunction with their core courses. This allows students to hyper-specialize in whatever topic is most relevant to them, from cybersecurity to wind turbine analysis to AutoCAD.

"The one-credit courses are kind of a low-risk option where students can get introduced to these important topics, and then later on, they can explore them on their own time," says Yamaura, who also directs this program.

Like the construction engineering master's degree, the energy infrastructure degree typically takes students two to three years to complete. The energy infrastructure program allows professionals to keep up with all of the changes happening in energy and advance in their careers in the future.

Looking to advance as an engineer?

Our programs are built in partnership with industry leaders and taught by expert faculty. Gain practical experience and technical skills with formats that fit your schedule — full-time or part-time, online or hybrid, evenings, and even weekends.

Learn more: ce.uw.edu/future/grad

Introducing the UW Center for Disaster Resilient Communities

By Jolayne Houtz

In September the UW launched the Center for Disaster Resilient Communities, convening experts to inform and strengthen how communities prepare for and respond to disasters.

The Center will engage the expertise of more than 100 UW faculty, including disaster researchers, engineers, data and environmental scientists, and experts in public health, medicine, nursing, public policy and planning.

It's supported by the UW Population Health Initiative, a university effort to incubate and advance interdisciplinary programs, projects and partnerships that help to create a world where all people can live healthier and more fulfilling lives.

Center experts will offer resources, training, technical assistance and solutions to improve community resilience to hazards that affect natural and built environments. A special focus is on communities where social conditions or vulnerabilities exacerbate disaster impacts.

The researchers will work directly with community, tribal and government partners to focus on community-identified needs and questions related to disaster preparedness, response and resilience. They will bring resources and expertise together to support community capacity development, including by conducting and translating science that supports disaster planning, training and exercises.

The Center will also offer education and training opportunities for next-generation disaster scientists, including graduate students and early-career researchers.

"Building disaster-resilient communities is incredibly complex and challenging. The new Center will foster and facilitate interaction and knowledge transfer between faculty and students across the UW," says CEE Professor Laura Lowes.

Photo above by Mark Stone

Fall snow levels can predict a season's total snowpack in some western states

By Sarah McQuate

A UW-led research team has found that in some western states, the amount of snow already on the ground by the end of December is a good predictor of how much total snow that area will get. This prediction works well in northern states such as Alaska, Oregon and Washington, and in parts of Utah, Wyoming and Colorado.

"We're fairly good at long-term average forecasts: what will happen 50 years from now. And we can do short-term forecasts: what will happen less than a week from now. But as for what's going to happen in the next three to four months, that's been kind of a no-go zone," says CEE Professor Jessica Lundquist. "It was really interesting to find that the amount of snow on the ground by the end of December ended up being a good predictor of peak spring snow."

To look for trends, the team collected data from a network of snow sensors across the western U.S., including Alaska. The researchers analyzed air temperature and accumulated precipitation from 2001 to 2022 for 873 sites. Then the team compared accumulated snow by the end of December (fall snow) to the maximum amount of snow accumulated over the entire winter-spring season (peak season snow).

There were different reasons for why fall snow levels predicted peak season snowpack levels. Some areas, such as Alaska, simply receive most of their snow before January. This means their early season snow is close to their peak season snow. In other places, the weather patterns are such that above-average snowfall earlier in the season indicates above-average snowfall is also likely later in the season.

Cooler air temperatures also helped with predictability. In northern states or in places at higher elevation, snow on the ground in the fall was less likely to melt between storms because the air remained cool. That means this snow will stick around and add to the total snowpack.

Photo below by Mark Stone

NSF Center for Soil Technologies

By Wayne Gillam

Healthy soils are foundational to life on Earth, but there's a lack of knowledge about many key aspects of soil and how changes in variables such as moisture and organic content can affect its health and stability over time.

To help address this knowledge gap, the National Science Foundation (NSF) recently launched the Center for Soil Technologies (SoilTech), a research effort between the UW, the University of Southern California (USC), Iowa State University and the University of Connecticut. Housed at USC, the Center is the first of its kind to develop sensing and analysis tools that can share real-time soil dynamics data with scientists and the nation.

At the UW, SoilTech efforts are led by Payman Arabshahi, an associate professor of electrical and computer engineering. CEE Professors Pedro Arduino and Faisal Hossein also hold key positions in the Center.

"In part, we model soils to prevent catastrophic failures of infrastructure that we build on top of our soil," explains Arduino, who oversees SoilTech research efforts in landslide and debris flow simulation and soil-structure interaction. "These issues typically happen because of dynamic interactions between soil and water. Whether we have an earthquake and get liquefaction of the ground or levee, dam or bridge failures, landslides after floods or massive rainstorms. These are all examples of phenomena that I am working on, modeling soils, and providing a predictive capability."

Hossain leads research in application of earth science discoveries with engineering technology to reduce social inequalities in availability of food, water and energy.

"I've deployed a combination of low-power, wide-area network sensors, and I am working with space agencies in India and Pakistan to track soil moisture and water usage in farmlands. This provides an advisory that sends information directly to the end user — the farmer," he says. "We have shown that by optimizing just this system alone, the farmer not only saves money on water, but crop yield goes up as well."

SoilTech is part of the NSF's Industry-University Cooperative Research Center program, which focuses on applying university research to meet industry needs, enhancing innovation and developing a skilled workforce. SoilTech will also implement practical, hands-on education for students across its academic institutions.

PacTrans invites high school students to summer transportation camp

In collaboration with the Washington State Department of Transportation (WSDOT), the Pacific Northwest Transportation Consortium (PacTrans) is working to nurture budding transportation engineers with a specialized summer camp at the UW. PacTrans's vision of bridging academic excellence with real-world experiences came to life over a five-day camp this past summer.

The program was open to Washington high school students. Attendees benefitted from onsite learning with lectures by professionals in the mornings and practical education in the field during the afternoon. The offsite learning excursions spanned significant transportation hubs, including the PACCAR Technical Center's testing facility, King County Metro's electric bus testbed and an Amazon Fulfillment Center.

Summer transportation camp students stand in front of the King County Metro's electric bus testbed.

As they toured different facilities, students had the opportunity to see a diverse range of transportation careers up close, from engineers working on transit solutions to logistics experts making sure operations ran smoothly. The tours were designed to allow students to see many areas of the transportation sector and ask questions to professionals in the field.

Highlighting PacTrans's commitment to statewide outreach, a concurrent camp was organized at Washington State University (WSU) for students from eastern Washington. The camp aimed to introduce high school students to the field of transportation engineering and promising careers in the sector.

HollyAnna DeCoteau Littlebull appointed assistant director of NW TTAP Center

In July, HollyAnna DeCoteau Littlebull joined the Northwestern Tribal Technical Assistance Program (NW TTAP) Center as its inaugural assistant director. Littlebull, a respected figure with 30 years in the public safety domain, has held roles as a medic, firefighter, police officer and educator.

Littlebull has deep-rooted expertise in traffic safety's four E's: engineering, enforcement, education and emergency response. She has previously served as the tribal traffic safety coordinator for the Yakama Nation Department of Natural Resources Engineering Program, where she was involved in drafting Washington state laws and tribal codes, including a pivotal child restraint law.

Littlebull's contributions to safety strategies and policy implementation have been recognized by the Transportation Research Board and the National Academies of Sciences, Engineering and Medicine.

In her new capacity at the NW TTAP Center, Littlebull plans to enhance the center's mission to equip northwestern tribal communities with essential training and technical support, bolstering tribal transportation programs throughout the region.

HollyAnna DeCoteau Littlebull

RAPID maps flood resilience in East Africa

Imagine the challenges of living in a home constantly threatened by the frequent coastal storms of East Africa. For countless residents in Dar es Salaam in Tanzania and in Mozambique, this is a distressing reality. To address this concern, Penn State University Ph.D. student Lorine Ouma spent the summer mapping out and collecting visual evidence of flood-inflicted damage with the help of researchers and equipment from the UW Natural Hazards Reconnaissance Facility, or RAPID. The hope is that these images can be used to increase future resilience of East African coastal communities.

This project was supported as part of the RAPID's Graduate Scholars program and also as part of a research grant to Professor Esther Obonyo at Penn State. Focusing initially on Dar es Salaam, the team sought to assess the performance of building materials when exposed to flooding. By analyzing the current state of flood-related damage along the East African coast, particularly in low-income housing areas, the team members were able to chronicle the extent of damage from previous floods. They expanded their research southward, reaching the coasts of Mozambique. In the images captured, they honed in on the prevalent construction materials and post-disaster recovery measures these communities have employed. The RAPID technology did this by capturing vivid street view images and immersive 360-degree videos from the affected coastal neighborhoods. Coupling this with point cloud data — a set of data points in space collected through laser scanners — they crafted detailed 3D models. These models offer insights into the kinds of housing damage on the ground, aiming to guide future flood prevention efforts.

The researchers chose to focus on Tanzania and Mozambique because of the escalating threats these nations face from coastal hazards. Mozambique, for instance, has weathered the devastating impacts of cyclones like Idai, Kenneth and the recent Freddy. The need for this research is heightened by the notable lack of data from this region of the world.

The team worked with Ardhi University in Tanzania and Eduardo Mondlane University in Mozambique to ensure the research included local insights and expertise. Funding for the study was provided by the National Science Foundation through RAPID and Penn State.

Below, clockwise from top left: A researcher uses RAPID equipment to capture data on a flood-damaged housing structure in Dar es Salaam; houses in Eastern Africa frequently face flooding, prompting community evacuations to safer areas; an abandoned residential house with damaged walls and foundations resulting from constant floods from the adjacent river.

Steel Bridge team's return to competition leads to a national bid

By Julia Davis

When people think of civil engineering, often one of the first things that comes to mind is building bridges. That's precisely what the Steel Bridge team has been doing this past year as they've traveled across the country to compete.

Hosted by the American Society of Civil Engineers (ASCE), the Steel Bridge Competition is a testament to young engineers' skills. It challenges student teams nationwide to construct a scale-model steel bridge that spans 20 feet and can carry at least 2,500 pounds.

This year was the UW team's first year back after a two-year hiatus due to COVID-19. In the spring, the team made its mark at the ASCE Student Symposium, which was held at Montana State University in Bozeman. Part of the symposium included the Regional Steel Bridge Competition, where the team's hard work and dedication paid off as they placed fourth place overall and garnered a commendable third place in the "Stiffness" category.

This impressive finish led to an unexpected invitation to nationals. But with success came a scheduling hurdle: the national competition overlapped with the CEE department graduation, meaning that the seniors could not accompany the team. With resilience typical of engineers, in the month between the regional and national face-offs, team members sprung into action, training and onboarding three new classmates to fill the seniors' spots so they could send a full team.

At nationals, which took place at the University of California, San Diego, the team competed with 42 schools from across the country. The team's bridge achieved ranking at the competition, meaning it fulfilled all the load tests and competition requirements. While they might not have clinched a top spot, team members' spirits remained undeterred. As Jana Escoton, a CEE student and the team's general manager, puts it, they were "just happy to be there."

Concrete Canoe team secures a regional win, and national recognition

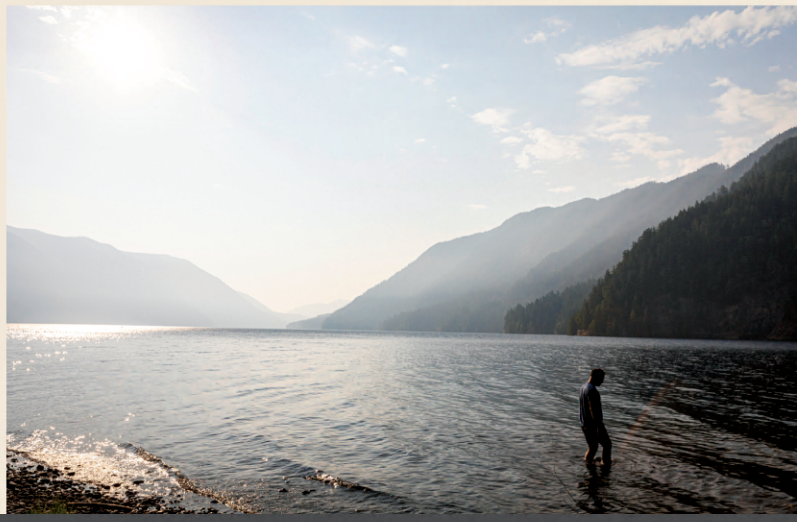
The UW Concrete Canoe team has consistently turned heads, not merely by showcasing the buoyancy of concrete, but by clinching victories in intense competitions. Last April, the team won first place at the American Society of Civil Engineers' PNW Student Symposium hosted by Montana State University in Bozeman. The team's momentum persisted into June, where it achieved an impressive eighth place finish at nationals at the University of Wisconsin-Platteville, competing against 24 other teams from across the country. Known to many as the "America's Cup of Civil Engineering," the Concrete Canoe competition is a fusion of hands-on application and theoretical mastery. It pushes students to sharpen their engineering skills, craft ingenious designs and strategize the daunting task of racing a very heavy canoe.

Future Rivers students explore Elwha Dam removal and river restoration

Future Rivers, the Freshwater Initiative's graduate student training program, prepares students to address complex freshwater issues. In August, students and faculty, including CEE graduate students Sanchit Minocha and Amy Quintanilla, and CEE faculty Faisal Hossain and David Butman, spent a week on Washington's Olympic Peninsula learning about the Elwha Dam removal and subsequent river restoration efforts. The group toured dam removal sites, the mouth of the Elwha River and Lake Crescent. They visited the Elwha Klallam Museum, watched and discussed the documentary "Return of the River" with the film's co-directors John Gussman and Jessica Plumb, and heard from guest speakers representing the Lower Elwha Klallam Tribe, the Washington Department of Fish and Wildlife, the National Park Service, and the U.S. Geological Survey. The students are now developing a visual storytelling product about their experience.

The Freshwater Initiative is a collaboration between the College of Engineering and the College of the Environment. Learn more: **futurerivers.uw.edu**

Photos by Mark Stone



Engineering elegance: CEE's debut spring formal

By Brooke Fisher

Building things from the ground up is a familiar and welcome challenge in CEE. While students enjoy a variety of social events, last spring two undergraduates noticed that something was missing: a proper formal.

"I didn't have a prom and I know several other people in my cohort who didn't have one as well. That was part of my motivation for getting an event like this out there," says CEE undergraduate Jana Escoton, who helped organize the department's first formal. "We were pretty excited to get all dressed up."

In the wake of COVID-19 — after missed high school proms and a lack of social events spanning two years — students were especially eager to socialize with their classmates.

"We have department mixers, but to dress up for a formal feels a bit more special," explains CEE undergraduate Nancy Le, who joined forces with Escoton to organize the formal. "I'm hoping it will be an annual event."

The duo was inspired to organize the department's inaugural formal after learning that a handful of engineering departments hosted annual dances. After a few "What if we start one, too?" conversations, they jumped right in. Held at south campus's Vista Café on April 22, the organizers capitalized off the Earth Day theme and decorated with spring-themed vines and flowers. After inviting the entire CEE community, attendance reached more than 120 — which included plus ones and even a handful of faculty. Attendees enjoyed catered food and drinks, dancing and games.

"We achieved our goal in terms of bringing the department together — there were a lot of people there," Escoton says. "We had a chance to find out more similarities about one another other than what we are studying. Building that sense of community is important post-COVID."

Engineers Without Borders

Since 2016, the UW chapter has been partnering with the Nicaraguan community of Tortuga to improve infrastructure.

By Brooke Fisher

When six UW students — members of the UW chapter of Engineers Without Borders (EWB) — arrived in Nicaragua last spring, they headed straight to the hardware store. They had nine days and numerous projects to complete. This was EWB's seventh visit to Tortuga, after forming a partnership with the community in 2016.

"It was a really unique experience and was mostly on-site learning — I've never done implementation of an engineering project like this before," says CEE student Monika Kaneshige.

Home to about 1,050 residents, Tortuga consists of a handful of markets, a school and a church. During the almost-annual visits, EWB students chip away on multi-phase projects focused on the community's water and sanitation needs, working with Tortuga's water and sanitation committee, the Comité de Agua Potable y Saneamiento (CAPS).

Improving water flow and latrines

Manually operating the water pump that supplies the community's main water system was a daily task for residents, until recently when the process for drawing water from a central well to fill water tanks was automated.

EWB students coordinated with a contractor to install float switches, which monitor the water level in the tanks and trigger the pump when levels get low. Automating the pump required digging a 500-foot-long trench for electrical cables.

The students also assessed an emerging concern: how to protect water pipes that cross five streams. Currently strung over trees, the pipes are susceptible to damage during tropical storms. On a return visit, students plan to bury the pipes in the streambeds and cover them with concrete and rocks.

Many residents use pit latrines, which can drain into private wells and contaminate groundwater. Options such as septic tanks are expensive, so the students worked on implementing two composting latrines. They poured a concrete foundation for the latrines, which have below-ground chambers for solid waste collection. Dry material like leaves is frequently added to help the waste decompose. Liquids are diverted outside to a bed of gravel to allow the wet waste to evaporate or percolate into the ground. Building on the students' progress, a local mason will construct walls for the structures.

Conferring with the community

Since hearing from community members helps guide the team's continued work, EWB students went door-to-door with questions in hand. They wanted to know what residents thought of the water system upgrades and how they feel about having a nonprofit working in the community.

Before departing, the students conducted a training session with CAPS members, who were taught how to troubleshoot inevitable malfunctions and respond to indicator lights.

"The community members were all super nice and inviting and gave us fruit and coffee," Kaneshige says. "I think we made a good connection with them while we were there."

Read the full story: engr.uw.edu/news/EWB

UW students and Tortuga community members work on the foundation for a composting latrine. Photos courtesy of Engineers Without Borders

First-year students become acquainted with “Drones n’ Lasers”

By Julia Davis

Some visitors walking along the UW’s iconic Rainier Vista last spring got to witness a free drone show, thanks to a popular CEE workshop that allows first-year students to collect data using LiDAR drones on campus.

“The energy that freshmen engineering students bring is one of my favorite parts of this workshop. They’re so excited to be there and in some cases, this is the first real hands-on engineering they’ve gotten to do since arriving at the UW,” says CEE Assistant Professor David Shean, the instructor of the workshop.

Shean introduced the “Drones n’ Lasers” workshop in 2022 to expose first-year students to some of the cutting-edge technology that engineers use to produce accurate 3D models. These models are used in nearly all areas of civil and environmental engineering — construction, geotechnical assessment, water resource management, natural hazard research and more.

LiDAR, which stands for Light Detection and Ranging, is a remote sensing technology that utilizes laser beams to precisely measure distances between the sensor and the earth’s surface. The LiDAR system emits rapid pulses of laser light at a specific target and then measures the time it takes for the reflected light to return. These drones collect thousands of points per second, which are then used to produce detailed and accurate 3D representations of the landscape. The ability to quickly capture high-resolution data over challenging terrain and densely vegetated areas gives LiDAR-equipped drones a significant edge in various industries and research endeavors.

The two-day workshop for students is a mix of theory and practice. Day one begins with an introductory presentation and group discussions about mission planning. This is followed by outdoor fieldwork where students configure and operate the LiDAR drone to survey Rainier Vista. After gathering this information, the students spend the second day of the workshop processing the data they collected and analyzing the resulting 3D models.

“Ideally, this workshop will inspire students who hadn’t considered CEE and geomatics as a potential career path. And hopefully they’ll go on to innovate, make a difference in the world, and use these tools to address some of the big issues that we’re facing today,” Shean says.

The workshop is one of many offered by the College of Engineering with the goal of allowing first-year students to try out different areas of engineering that they may be interested in.

David Shean, second from right, shows students the drone used to collect information for 3D modeling. Photo by Mark Stone

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