

# HUMANITARIAN ENGINEERING



## Engineering for Community Good

Oregon State University's Humanitarian Engineering program is an academic offering like few others in the United States, and it is the only program of its kind in the Pacific Northwest. We offer an undergraduate minor as well as core graduate-level coursework in humanitarian engineering, science and technology (HEST). We involve faculty across the university, and offer our students local and global field research opportunities and graduate fellowships.

### Core philosophy

We define humanitarian engineering as the use of science- and technology-based solutions to address basic human needs and improve quality of life particularly for those in underserved communities.

### Programmatic goals

We provide opportunities for our students to practice engineering in context, going beyond the technical to include social, cultural, environmental, political, and economic factors. Our programmatic goals are to:

- Enable students to develop global competencies and transferable skills, such as communicating to diverse audiences or working on multidisciplinary teams.
- Benefit local and global communities through research, community engagement, and experiential learning.
- Grow interdisciplinary and international research programs in humanitarian engineering and global development at Oregon State University.
- Embody the principle that there is strength in diversity, where striving for inclusivity is the norm.

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*Oregon State University is a public research university, a Carnegie I research institution, and one of only three U.S. universities to have Land, Sea, Sun, and Space Grant designations, allowing for unique national and global partnerships with academic, government, and industry leaders.*

## By the Numbers

**20+**

HEST-affiliated  
faculty  
from seven OSU colleges

**> 50**

students impacted through  
academic offerings or  
fellowships;  
~70% are women

**24**

students completing  
international  
field research

**14**

Evans Family  
fellowships awarded

**> \$1.7M**

program funds raised

# Travel, Learn, Help: How We Achieve Engineering Excellence

## International field research

Humanitarian engineering students travel across the globe to conduct research. For example, Assistant Professor Nordica MacCarty (mechanical engineering) and Associate Professor Liz Schroeder (economics) co-teach a field course, "Household Energy in Guatemala." In this course, students develop research questions on home energy usage and collect data in the field.

## Peace Corps program

We have hosted a Peace Corps Master's International (PCMI) Program since 2014. Peace Corps is ending its PCMI program at the end of 2017; however, we encourage returned Peace Corps volunteers to apply to OSU's graduate programs.

## Fellowship opportunities

Our premier fellowship program is the Evans Family Fellowship. Fellowships have been awarded to develop a school-to-school program between African and U.S. partners for the Trans-Africa Hydrometeorological Observatory (TAHMO); work on quantitative data analysis of water issues in Ethiopia; build capacity on earthquake resilience in Nepal, and more.

Additional scholarships have been awarded for student travel for the Guatemala field course, Capstone Design teams, or internship opportunities.

## Humanitarian engineering coursework

The undergraduate humanitarian engineering minor requires 27 credits, many of which can be double-counted with Baccalaureate Core requirements. Core offerings include:

- HEST 310: Introduction to Community Engagement and Co-Design (Bacc Core)
- ANTH 482/582: Anthropology in International Development
- HEST 411/511: Engineering Design for Emergency and Low-Resource Environments
- HEST 412/512: Multidisciplinary Perspectives on Case Studies in HEST (OSU Ecampus)
- HEST 399: Engineering for Global Health Solutions
- HEST 299/599: Household Energy in Guatemala

## Capstone Design projects

Our seniors have opportunities to complete HEST-related Capstone Design projects. For example, in 2015-2016, a team worked to develop a manufacturing process for soap making in partnership with groups in Oregon and Uganda. The women of TERREWODE, an organization focused on the prevention and treatment of obstetric fistula, are starting a social enterprise and have their first customer order for 1,000 bars of soap. Over the



A family's cooking fire is monitored during a cookstove adoption study in Guatemala; their dog enjoys the warmth.

## Key Oregon State University Partners

Beyond the **College of Engineering**, academic partners include:

**College of Agricultural Sciences | College of Education**

**College of Earth, Ocean, and Atmospheric Sciences**

**College of Forestry | College of Liberal Arts**

**College of Public Health and Human Sciences**

**The Water Resources Graduate Program**

summer, the design team continued project work in Uganda, researching potential process improvements.

## Examples of faculty research

John Selker, professor of biological and ecological engineering and co-director of both CTEMPs.org and TAHMO.org, has carried out research in Chile, Ghana, Kenya, Uganda, Senegal, Israel, China, and 10 European countries. His areas of expertise include groundwater, hydrology, water systems, electronic design, and development projects.

Nordica MacCarty, assistant professor of mechanical engineering, is conducting research to develop multidisciplinary computational decision-making tools which enable technology and policy designs. Her work aims to holistically address the social, economic, environmental, and health needs surrounding household energy in developing communities.

Kendra Sharp, professor of mechanical engineering, researches sustainable energy and water resources in the Hindu-Kush area. Her research has led to the creation of open-source climate data downscaling and hydropower assessment tools. For this work Dr. Sharp has received funding from the National Science Foundation and USAID; additionally, she is an endowed professor in humanitarian engineering.