



**Course name:** *Food, Energy and Water Systems*

**Instructor:** *Steven Wright*

**Program Dates:** *July 14-27, 2019*

**Number of Credits:** 3

### **Course Description**

Costa Rica is a leader in sustainable development and an ideal setting for study in the Food/Energy Water Nexus. The program will introduce students to the basics of food, energy, and water systems and will progress into an in-depth analysis of the interconnected nature of these systems, and the associated environmental consequences.

Course themes will include the energy and water costs of different types of agricultural systems, climate change impacts, renewable energy systems and their environmental impacts, and sustainable options for developing countries.

Discussion of the scalability of alternative technologies such as aquaponics systems, biomass gasification and precision irrigation water delivery will occur. Students will be able to examine tropical agriculture systems on EARTH facilities.

Visits will also be made to external facilities such as renewable energy production facilities and a research station for integrated pest management for banana and pineapple production.

Students interested in sustainable agriculture and energy and water management are encouraged to apply. While the class will have a more technical focus, students interested in policy for environmental management and sustainable development would also gain great insights applicable to their fields.

### **Course Objectives**

At the end of the course, the student should be able to:

- Understand the basic requirements for agricultural production, including nutrients, water and energy requirements. Lectures will be supplemented by visits to agricultural facilities.
- Understand the basics of energy production and the basic requirements for various energy technologies with emphasis of renewable energies.
- Understand the basics of water systems, with emphasis on water systems for irrigated agriculture and energy production
- Understand the importance of spatial and temporal variations in water and energy demand and the constraints on system configuration to address these variations.
- Apply these concepts to the development of small scale sustainability projects related to food, energy and/or water.



- Appreciate the difficulties in anticipating environmental consequences of large scale projects.
- Understand the basis for evaluation of project viability, especially using Life Cycle Assessment and various impact footprint tools.

## **Grading**

### **Instructor Biography**

Steven J. Wright, PhD, Professor Emeritus of Civil and Environmental Engineering, The University of Michigan.

Bachelor's (Agricultural Engineering) and Master's (Hydraulic Engineering) degrees from Washington State University and PhD (Civil Engineering) from California Institute of Technology. 41 years on the faculty of the Civil and Environmental Engineering department at the University of Michigan. His general area of expertise is Environmental and Water Resources Engineering.

His activities include work on large scale water resources projects (including reservoir management in the Snake River system to facilitate salmonid recovery in the Columbia River Basin; environmental impact assessment for large scale hydropower projects, proposed for Patagonia, Chile; Environmental assessment for proposed World Bank project of Red Sea to Dead Sea diversion) and advising smaller scale sustainability projects in Latin America and Africa through various initiatives.

He has previously taught seven courses with food/energy/water themes in various international contexts (Chile, Kenya and Liberia) as well as an extended version of the current course in 2017 and 2018 through the University of Michigan.