Education for Leadership Roles
The core of our program is designed to provide graduate education in holistic aspects of environmental systems around which knowledge and principles of environmental science can be organized. We strive to train the next generation of engineers and scientists to meet the engineering, environmental and social grand challenges of the 21st century leading to better Earth stewardship. We wish to advance discovery and understanding by integrating participatory research and experiential learning in an interdisciplinary environment that stresses professional training, career development, ethics and the responsible conduct of research.

Research Focus Areas
The program in Systems Ecology and Ecological Engineering (SysEco/EcoEng) has several related themes including Ecological Engineering, Emergy Analysis, Wetlands Ecosystems, Ecological Modeling, and Estuarine Studies. Overall, the objective of the program is to determine how environmental and human systems operate and influence each other and how they can be managed so that development and environment are symbiotic and sustainable and contribute to maximum productivity.

Ecological engineering focuses on the interface between technology and environment, developing engineering design solutions that incorporate the self-organizing and self-maintaining processes of the environment.

Emergy analysis focuses on evaluation of ecosystem services and natural capital, energy resources, and environmental impacts using a unit of measure called emergy (spelled with an “m”).

Wetlands ecosystem research focuses on all aspects ecological and hydrological functions of wetlands including coastal wetlands. Our interest in wetlands spans ecosystem health, wildlife functions, ecohydrology, restoration and conservation.

Ecological Modeling focuses developing quantitative understanding of systems of humanity and nature from the perspective of their dynamic behavior considering drivers, “tipping points”, homeostatic tendencies, and system hysteresis.

Estuarine Systems focuses on the basic processes of estuarine systems and their responses to human development, hurricanes, dredging, impoundments, freshwater inflows, and inlet management.

Research Opportunities
Current and past research in Systems Ecology and Ecological Engineering is driven by the overall goal of developing more sustainable and symbiotic interfaces of humanity and environment.

Ecological engineering - current research includes understanding the nutrient uptake rates of algal systems as potential for storm water treatment technology. Previous research in areas of ecosystem restoration, wastewater recycle in wetlands, stream restoration, and combined physical chemical and biological treatment for lake nutrient removal have yielded important results for interfacing humans and their environment.

Emergy analysis – current research includes a project with the Environmental Protection Agency to develop a template to include emergy in the Life Cycle Analysis framework of biofuel production. Past research includes: comparative studies on energy production systems of hydroelectric power, oil, wind generation, geothermal systems, coal, biomass, and wood; the economic and environmental costs and benefits of different water supply alternatives for public water supply in Florida; the costs of soil erosion and potential benefits from forestry practices...
that conserve soils in West Africa; and evaluation of the natural capital and environmental services of the US National Forest and Grasslands.

**Wetlands ecosystem research** – current research includes two projects for the USEPA to evaluate wetland ecosystem health as part of the National Wetlands Condition Assessment; a project for the Florida Department of Environmental Protection evaluating oxygen concentrations in reference wetlands; and a project evaluating the effects of nutrients and flow rates on algal production in springs. Past projects include: water quality enhancement properties of wetlands, studies of seed banks, early successional pathways, microtopographic relief, impacts of water withdrawal on wetlands, techniques and guidelines for wetlands construction, and nutrient cycling in wetlands.

**Ecological modeling** – current research focuses on combined microcosm and modeling study of the role of pulsing disturbance on ecosystem productivity. Past projects include: ecological modeling of the impacts of increased salinity on Lake Gatun, Panama, models of carrying capacity for the Florida Keys, and ecological economic model of water allocation in Florida.

**Estuarine systems** – Past research has focused on the determination and modeling of ecological impacts of salinity fluctuations, turbidity, and temperature on seagrass dominated ecosystems in Florida Bay, Apalachicola Bay, and Indian River Lagoon, as well as pollutant storage within system sediments in and near the Timicuan Preserve.

**Facilities**

The program in Systems Ecology and Ecological Engineering is centered at the Phelps Laboratory in the heart of the UF campus. The Phelps Lab is the home of two research centers started by H.T. Odum: the Center for Wetlands, founded in 1973, and the Center for Environmental Policy, started in 1990. The Howard T Odum Centers have complete ecological lab facilities, field vehicles, boats, computer facilities and a library. All students in the program have office space in the Phelps Lab.

**Employment Opportunities**

Students graduating from our program with masters and doctoral degrees are prepared for professional employment in government agencies from local planning and environmental resource departments, to state agencies of environmental protection and water management, to federal agencies including the USEPA, USCOE, NOAA, USGS, USDA, etc. Also students are well prepared to enter the private sector in engineering firms dealing with environment and planning, and consulting firms in a variety of disciplines. Our PhD students find employment in the academic world in many different programs including Environmental Engineering, Forest Resources, Ecology, Agricultural and Biological Sciences, Soil and Water Sciences, Ecological Engineering, Environmental Studies, etc.

**Courses**

Systems ecology and modeling systems of humanity and nature
Energy Analysis
Ecological engineering (certificate)
Environmental policy and management (certificate)
Wetlands studies (certificate)
Aquatic/estuarine ecology

**Contact information**

For information on graduate admissions requirements, research opportunities and funding information, please visit the web site for the Engineering School of Sustainable Infrastructure & Environment at [www.essie.ufl.edu](http://www.essie.ufl.edu).

For specific inquiries, e-mail gradinfo@essie.ufl.edu

Specify Systems Ecology and Ecological Engineering