

## **Proposed Minor in Ecological Engineering**

### **Description of Ecological Engineering**

Ecological Engineering is the design of sustainable systems that integrates traditional engineering concepts with fundamental ecological principles. These principles include resiliency, adaptation, and community dynamics. Ecological concepts are of fundamental importance in the designs of robust and sustainable systems that integrate human activities with the natural environment.

Some examples of ecological engineering are:

- Ecosystem restoration and habitat design at multiple scales
- Watershed management and enhancement
- Integrated waste treatment systems and beneficial use of waste products
- Phytoremediation and bioremediation
- Industrial ecology
- Constructed wetlands and restored impaired wetlands
- Mitigation of non-point source contamination
- Wisely increasing ground water recharge through 'low impact' design and other methods

### **Participating academic programs**

The Ecological Engineering minor is supported by courses in the departments of Bioproducts and Biosystems Engineering (BBE), Civil Engineering (CE), Geology and Geophysics (GEO), and Ecology, Evolution and Behavior (EEB). The BBE department will be responsible for administrating the minor.

### **Requirements**

To obtain the minor in ecological engineering the student will need to complete the degree requirements of an engineering program with the Institute of Technology. As part of or in addition to these requirements, students must take at least one course in each of the three core areas of ecological sciences, hydrologic sciences, and ecological engineering design. Acceptable courses in each of the core areas are shown below.

*Ecological Sciences:* BIOL 3407, 3408(W) – Ecology; BIOL 3807 – Ecology; EEB 4068 - Plant Physiological Ecology; LA 3204 - Landscape Ecology.

*Hydrologic Sciences:* CE 4501 – Hydrologic Design or BBE 5513 – Watershed Engineering or FR 5114 – Forest Hydrology and Watershed Management

*Ecological Engineering Design:* BBE 4523/5523 Ecological Engineering (currently BBE - Water Management Engineering)

In addition to these core courses, the students must take 10 or more credits from the following list of courses:

BBE 3023 Principles of Ecological Engineering – (Currently BBE 3023: Engineering Principles of Soil-Water-Plant Processes)

BBE 4533 - Agricultural Waste Management Engineering

BBE 4013 - Transport in Biological Systems

BBE 5533 – Assessment and Diagnosis of Impaired Waters

CE 3301 – Soil mechanics I

CE 3501 – Environmental Engineering

CE 4562 – Environmental Remediation Technology

CE 4351 - Groundwater Mechanics

CE 4352 - Groundwater Modeling

CE 4502 – Water and Wastewater Treatment

CE 4512 – Open Channel Hydraulics

CE 4561 – Solid Hazardous Wastes

CE 5541- Environmental Water Chemistry

CE 5581 – Water Resources: Individuals and Institutions

EEB 3001 – Ecology and Society

EEB 3603 – Science, Protection and Management of Aquatic Ecosystems

EEB 4014 – Ecology of Vegetation

EEB 4609W – Ecosystem Ecology

EEB 4611 – Biogeochemical Processes

EEB 5601 - Limnology

ESPM 3003 – Sustainable People, Sustainable Planet

ESPM 3101 – Conservation of Plant Biodiversity

ESPM 3111/ 5111 – Field Hydrology and Water Quality

ESPM 3245 – Sustainable Land Use Planning and Policy

ESPM 3251 – Natural Resources in Sustainable International Development

ESPM 3603 – Environmental Life Cycle Analysis

ESPM 3604 – Environmental Management Systems and Strategy

ESPM 4216 – Contaminant Hydrology

ESPM 4608 – Bioremediation

FR 5104 - Forest Ecology

FR 5153 – Forest and Wetland Hydrology

FR 5204 – Landscape Ecology and Management

GEO 3005 – Earth Resources

GEO 4631W – Earth Systems: Geosphere/Biosphere Interactions

GEO 5205 – Fluid Mechanics in Earth and Environmental Sciences

GEO 5108 – Principles of Environmental Geology

GEO 5701 – General Hydrogeology