

# Ecological Engineering in the Tropics

## FEG 311/ ERE 511

### Example Syllabus

**Instructor:** Dr. Ted A. Endreny, 423 Baker Labs, te@esf.edu, 315-470-6565

**Field Experience:** Honduras, Central America, Spring Break + 1 day buffer

**Course Web Page:** Materials maintained at blackboard.syr.edu

#### Course Text & Materials

- Mitsch, W.J. and S.E. Jorgensen. 2004. Ecological Engineering & Ecosystem Restoration, Wiley Publishing.
- Weisman, A., 1998. *Gaviotas: A Village to Reinvent the World*, Chelsea Green Publishing
- Calculator, Field Journal, Tropical Field Clothes (light weight & quick drying)

#### Safety Policy

Student safety is fundamental to this course, and to help achieve this goal, students should review medical precautions at: <http://wwwn.cdc.gov/travel/destinationHonduras.aspx>.

#### Outcomes

Upon completion of this course, the student will have:

- a) Generated designs for visited watersheds that illustrate the governing principles of ecological engineering [Note design is defined as: addressing an open ended problem, identifying the goal and constraints, creating and analyzing broad design alternatives, using ecological engineering theory to complete optimal design option, and evaluating how design satisfies goal and constraints.];
- b) Presented designs to the class using appropriate communication skills, responded to pertinent questions, and incorporated group supported suggestions in at least 1 design;
- c) Investigated sites through exploration and appropriate questions of authorities to identify and rank development and design constraints for creating a sustainable future in the visited sites;
- d) Written a short final report that addresses the science, engineering, and cultural features of the watershed management opportunities for visited sites; and
- e) Summarized growth of your cultural awareness as it relates to professional opportunities in tropical countries, based on regularly recorded journal entries from the field trip.

#### Assignments

**Class Assignments:** 5 pre-departure question-sets on assigned readings

**Field Assignments:** 4 to 5 designs, 2 to 3 data collection exercises, in-Honduras

#### Evaluation System

The quality of your work will be based on stating goal, describing approach, identifying constraints and alternatives, application of appropriate theory and methods, completeness, technical and cultural thoughtfulness, supporting material, and clarity in presentation.

#### Point Allocation

- Class Assignments (redo options)=30%

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- Field Assignment & Presentation=40%
- Participation in Discussions =30%

**Tentative Agenda for Class & Field**

<i>Week</i>	<i>Topic</i>	
1	Ecological Engineering in the Tropics & Ecosystem Restoration	
2	Theories & Paradigms of Ecological Engineering	
3	Ecosystem Processes & Services	
4	Ecological & Engineering Design Principles	
5	Stream & River Restoration	
6	Wetland Restoration	
7	Coastal Restoration	
8	Preparation for Spring Break Trip	
<b>Honduran Spring Break Trip</b>		
<i>Day of Week</i>	<i>Location</i>	<i>Activity</i>
Thursday (5)	ESF - San Pedro Sula – Tela	Travel to Honduras; Introduction to North Coast Garifuna culture & Caribbean Sea
Friday (6)	Tela – daylight (Lancetilla and urban watersheds)	Moist tropical mountain forest and urban land management - watershed stresses (mountain slash and burn agriculture, grazing, solid and sanitary waste) – system response dynamics (meandering river, polluted coastal waters) Note – meander wave length and radius and floodplain access.
Saturday (7)	Tela – (Garifuna communities, Punta Sal National Park)	Mountain watershed management – watershed protected areas, land use types, and eco-tourism. System stability and stress-response dynamics. Note - boulder step-pool rivers, velocity, sediment load, roughness, entrenchment, and riparian corridor.
Sunday (8)	La Ceiba (Pico Bonito National Park)	Coastal watershed management – watershed stresses (monoculture pineapple, banana production, grazing, eco-tourism) – system response dynamics (mangrove wetland, manatee grass bed, and coastal and mountain river) Note – cascading river slope, velocity, sediment load, roughness and riparian buffer extent.
Monday (9)	La Ceiba (Plantations; Cuero y Salado; Rio Cangrejal)	Agricultural experimental station sites – sustainable watershed land use alternatives (agro-forestry, agro-ecosystem; ex. cacao, coffee, tropical hardwood farm systems). Note – braided rivers and vegetation establishment in center bars, sinuosity of thalweg vs. channel banks.
Tuesday (10)	La Ceiba day trip to Buena Vista (community water supply and eco-hydrology of	Watershed response to Hurricane – braided river sediment patterns and mid-channel island bar formation, island vegetation, and shear

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	mountain river)	stress. This community water supply (CWS) is part of the Engineers without Borders projects. In all travel, make watershed observations and discussion of progress on learning outcomes.
Wednesday (11)	La Ceiba day trip to Olanchito (Aguan Valley, dry forest preserve)	Dry land watershed management – watershed stresses (monoculture banana farms, grazing, fire, agriculture) – system response dynamics (riparian degradation, braided rivers, habitat fragmentation, species decline). Note –fluvial lateral connectivity with riparian habitat, and longitudinal profile with substrate type.
Thursday (12)	La Ceiba – day trip to Fringing Reef of Cayos Cochinos (mangrove and reef)	Caribbean island (urban land, mangrove, beach, reef, aquatic) management – ecosystem stresses (global acidification and warming, vehicle traffic, excess sanitary flows, tourism load, construction and erosion, poaching) – system response dynamics (polluted air and water, stressed reefs, filled wetlands). Note – reef management strategies and refuge impacts.
Friday (13)	La Ceiba to Copan (sustenance and corporate agriculture)	Pine cloud forest watershed and riparian corridor management - watershed stresses (urban sprawl, extreme gradient hillslope farming, mountain deforestation, grazing) – system response dynamics (stormwater flooding, excessive erosion, river degradation) Leisure.
Saturday (14)	Copan (Coffee Farm and eco-tourism with orchids, birds, butterflies)	Aspects of shade grown, canopy protected, coffee farming and production, with discussion of key vegetative species and commercial markets for benefits to both ecosystem and society.
Sunday (15)	Copan (Mayan site, river)	Ancient civilization to modern excavation watershed management – watershed stresses (agricultural practices, population density, climate shifts, restoration countermeasures) - system response dynamics (society stress and collapse, stormwater drainage scour, river flooding and adjustment). Note – stormwater infrastructure and river slope, meander length, sediment load, roughness material, and lateral riparian connectivity.
Monday (16)	Copan - San Pedro Sula – ESF	Learning outcomes completed. Leisure