



NATURE-BASED INFRASTRUCTURE ENGINEERING AND DESIGN

ENGR 8990 - SPRING SEMESTER
Dr. Brian Bledsoe



UNIVERSITY OF
GEORGIA
*Institute for Resilient
Infrastructure Systems*



COURSE DESCRIPTION

Integration of engineering, ecological design, and economic perspectives in the planning, design, implementation, and adaptive management of nature-based infrastructure systems that work in harmony with conventional infrastructure. Innovative use of natural processes and systems to increase infrastructure performance, efficiency, and benefits (social, environmental, and economic).

GRADING SYSTEM

A - F, Traditional

CREDIT HOURS

Credit Hours: 3
Lecture Hours: 3
Lab Hours: 0

DELIVERY

Lecture

REQUIRED PREREQUISITES

Background coursework in hydrology, ecology, and economics, or permission of instructor.

COURSE OBJECTIVE

Students are prepared to serve as a productive and effective member of an interdisciplinary project delivery team (PDT) for a large-scale headwater, riverine or coastal natural infrastructure (NI) project.

SCHEDULE

Date and time to be determined by student consensus. For example, Monday afternoon one day per week vs. Monday and Wednesday afternoons.

GRADING

Homework 35%

Class participation 10%

Midterm exam 25%

Class project 30%

TOPICAL OUTLINE



1. Overview and initial example projects
 - a. USACE Engineering with Nature® Atlas
 - b. Status of natural infrastructure implementation in the US and globally
2. Definitions
 - a. Infrastructure
 - b. Natural Infrastructure
 - c. Green Infrastructure
 - d. Natural and Nature-Based Features
 - e. Hybrid Green-Gray Infrastructure
 - f. Civil and Environmental Engineering, Ecological Engineering, Environmental Design
 - g. USACE Engineering with Nature®
 - h. Ecological Economics
 - i. Resilience
 - j. Social-technical-environmental systems
3. Benefits, functions and services provided by NI
 - a. Economic
 - b. Environmental
 - c. Social
4. Risk analysis
 - a. Statistical approaches – stationary and nonstationary
 - b. Uncertainty analysis
 - c. Residual risk
5. Tools – hydrologic, hydraulic, ecological models, MCDA, GIS tools, benefit calculators
6. Project planning process (emphasis on USACE planning process)
 - a. Identifying problems and opportunities
 - b. Inventorying and forecasting conditions
 - c. Formulating alternative plans
 - d. Evaluating alternative plans
 - e. Comparing alternative plans
 - f. Selecting a plan
7. Planning and design of specific natural and nature-based infrastructure features and systems
 - a. General principles
 - b. Upland systems
 - c. Riverine systems
 - d. Coastal systems
 - e. Systems perspectives and scale considerations
8. Project O&M, monitoring and adaptive management
9. Integration of conventional and natural infrastructure
 - a. Flood management
 - b. Drinking water and wastewater
 - c. Transportation – highways and navigation
10. Looking ahead – prospectus for NI