

EES 8200 Environmental Systems Analysis

Spring 2014

Time: 9:05 – 9:55 Monday, Wednesday and Friday

Location: 111 Brackett Hall

Instructor: Annick Anctil, Ph.D.

Assistant Professor, Environmental Engineering and Earth Sciences

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Office hours: After class on Wednesday in 430 Bracket Hall or by appointment

Course Description

Decision making in environmental engineering can be a complex process due to conflicting objectives by various stakeholders, in particular as it relates to economic and social aspects. The course will introduce student to fundamental optimization theories required to address complex multi-objective problems encountered in environmental sciences. Application of environmental system approach will be presented with real world applications in the area of environmental systems planning, resources conservation, pollution control and sustainability. Multi-criteria decision methods, which provide mathematical methodology to incorporate the values of various stakeholders and technical information to select the best solution for a particular problem, will be discussed.

Resources

There is no text for this course. Readings and handouts will be posted periodically on Blackboard. Additional information and some examples will be taken from:

De Neufville, R.; Applied Systems Analysis: Engineering Planning and Technology Management :

http://ardent.mit.edu/real_options/ASA_Text/asa_Text_index.html

Assessment Criteria

1. Homework 50%
 - Readings: (including in-class participation) 15%
 - Assignments: 35%
2. Project 20%
3. Midterm 15%
4. Final 15%

Homework will be assigned regularly throughout the semester. For the readings, a critical review will be required and in-class participation will be evaluated. Late homework will receive an automatic 10% deduction for every day overdue.

Policy

- Attendance at regular scheduled class meetings is expected as well as participation in class discussions.
- In the event of an unplanned absence by the professor, class will be cancelled after 15 minutes
- Academic honesty is expected. Any violation of Clemson University policy as described in the Student Handbook will not be tolerated and may result in a failing grade.

Tentative Course Outline (Subject to Change)

Unit 1: Systems Optimization (Weeks 1-8)

Week 1 System definition and Establishing Objectives

Week 2-3 Production functions, constrained optimization and marginal analysis
(Project presentations)

Week 4-5 Linear Programming

Week 6 Sensitivity Analysis

Week 7-8: Simulations and portfolio optimization

Exam 1 – Take Home

Unit 2: Multi-Criteria Decision Analysis (Weeks 9-15)

Week 9 Solutions Using Alternate Objectives

Trade-off Evaluation (Environmental, Economic, Social Criteria)

Week 10-12 MCDA methods and applications in Environmental sciences

Week 13 Qualitative Methods

Week 14 LCA and sustainability index as form of Systems Analysis

Week 15 Presentations

Final- Take home