

CE 5333 – Application of Systems Concepts for Civil Engineers

Course Location, Textbook, Instructor Contact Information

Class meetings:	XX:XX-XX:XX TBD
Instructor:	Theodore G. Cleveland, CE Room 203F
Office Hours:	Open Door Policy
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Textbook(s) :	materials on server; representative list at end of document Temporary guest access until 1 Sep 2018. Guest password is: jamesbond
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Catalog Description

5333: Special Problems in Water Resources (3:3:0) Individual studies in water resources. May be repeated for credit. Practical application of systems analysis and modeling in Water Resources context. The computer programs include focus on model formulation, planning and design issues. System integration of on-line simulation tools is presented. Prerequisite: Instructor consent.

Objectives

Upon completion of this course, students should be able to:

1. Construct solution tools using **R** as a computation engine and **Excel** as an interface for small-scale linear and non-linear programming problems.
2. Locate and use solution tools for large-scale linear and non-linear programming problems.
3. Formulate integrated simulation and optimization models for improved decision making and analysis in water resources management.

4. Quantify risks and uncertainties in planning, design, and management objective(s) in water resources systems.
5. Evaluate alternatives in water resources management with respect to economic, environmental, ecological, regulatory, and social aspects.
6. Describe the large scale complex interactions between engineered infrastructure and natural systems and the issues associated with holistic decision-making.

Course Schedule

Table 1: CE 5366 Schedule – FALL 2018

DATE	TOPIC	READINGS	DUE
28 Aug 18	Introduction (Video Lecture)	Lesson-1	ES-1
30 Aug 18	Water Law	Lesson-2	
04 Sep 18	Psychology of Decision Making	Lesson-3	
06 Sep 18	Programming with R	Lesson-4	
11 Sep 18	Allocation by Linear Programming (LP)	Lesson-5	ES-2
13 Sep 18	Allocation by Non-Linear Programming (NLP)	Lesson-6	
18 Sep 18	Economic Valuation of Alternatives	Lesson-7	
20 Sep 18	Job Fair		
25 Sep 18	Economic Mathematics (Video Lecture)	Lesson-8	ES-3
27 Sep 18	Benefit/Cost Analysis (Video Lecture)	Lesson-9	
02 Oct 18	Price Theory Allocation of Scarce Resources	Lesson-10	ES-4
04 Oct 18	Economic Optimality	Lesson-11	
09 Oct 18	Welfare Economics	Lesson-12	ES-5
11 Oct 18	Simulation Concepts	Lesson-13	
16 Oct 18	River Basin Flow Simulation	Lesson-14	ES-6
18 Oct 18	Groundwater Basin Flow Simulation	Lesson-15	
23 Oct 18	Mass Transport Concepts	Lesson-16	ES-7
25 Oct 18	Dissolved Oxygen in Rivers	Lesson-17	
30 Oct 18	Lake Water Quality Simulation	Lesson-18	ES-8
01 Nov 18	Groundwater Basin Quality Simulation	Lesson-19	
06 Nov 18	Optimization Concepts – Merit Functions	Lesson-20	ES-9
08 Nov 18	Water Treatment Allocation by NLP	Lesson-21	
13 Nov 18	Incorporating Uncertainty	Lesson-22	ES-10
15 Nov 18	Water Diversion - Stochastic Programming	Lesson-23	
20 Nov 18	Water Diversion - Chance Constraints	Lesson-24	

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Table 1: CE3305 Schedule (Tentative — Continued)

DATE	TOPIC	READINGS	DUE
22 Nov 18	Thanksgiving Holiday		
27 Nov 18	Resource Allocation - Groundwater Supply	Lesson-25	ES-11
29 Nov 18	Resource Allocation - Pecora Basin, Chile	Lesson-26	
04 Dec 18	Resource Allocation - River Water Quality	Lesson-27	ES-12
10 Dec 18	Final Exam (Sec 001)(13:30-16:00)		

Assessment Instruments

Participation

In class participation includes attending classes and participating in class discussions. Professional conduct is expected in all class activities. Please let the instructor know if you must miss a class for academically-related extracurricular activities, debilitating illness, or death in the family. You are responsible for any work that was missed on the day of your absence.

Homework

Exercises are via upload to the class Moodle server. The server accepts **.pdf** submissions as a single file. For typeset documents you can save/export them as **.pdf**. Handwritten content will need to be scanned into a **.pdf**, and bundled into a single file. **R** scripts can be screen captured and inserted into the documents as needed.

LATE HOMEWORK within 1 week of the due date will be accepted, but the score will be multiplied by 1/2 (50% reduction); homework received one week beyond the due date will not be graded. The server is the final arbiter of timeliness, it is programmed to close submissions one week after a due date.

Homework are evaluated as professional engineering work and should be completed in a neatly organized and reproducible fashion as specified. Students may work with other students; however, the student is responsible for his/her own work and must submit separately.

Note: Computer usage will be extensive and students will be required to download and run computer models. In addition, ability to use spreadsheets, word processing and presentation software will be necessary. Any written programs must be attached to the homework.

Exams

Exams will be a combination of in class and take home. No make-up exams will be given for unexcused absences. If you must miss an exam, you must notify the instructor prior to the exam date to determine whether that absence is excused.

Grading Policy

Final grades are determined based on performance during the course. Letter grades will be assigned using University standards. The **approximate** weighting of graded material in determining the final grade is as follows¹:

Item	Percent of Grade
Participation	10%
Homework	50%
Final Exam	40%

ABET Program Outcomes

A subset of the ABET Program Outcomes are addressed in CE 4333, these outcomes are listed below:²

- 3[a]. Ability to apply knowledge of mathematics, science, and engineering.
- 3[b]. Ability to design and conduct experiments, as well as to analyze and interpret data.
- 3[e]. Ability to identify, formulate, and solve engineering problems.
- 3[i]. Recognition of need for life-long learning.
- 3[k]. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- 8[d]. Proficiency in water resources engineering.

Academic Misconduct

Refer to the Texas Tech University Catalog and operating policies (OP 34.12) regarding academic integrity, cheating, and plagiarism. Academic dishonesty will not be tolerated.

¹Graded materials with fewer than 100 points will have raw scores normalized to 100 points for calculating the final grade.

²Item 3[b] below is only partially fulfilled – in this course students will analyze and interpret data, design of experiments is beyond the scope of the class.

Disability Policy

“Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructors office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806- 742-2405.”