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Spring 2014

## Water Resource Systems Analysis - Colorado State University

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## **COURSE OUTLINE**

### **CIVE 546 Water Resource Systems Analysis**

**Credits:** 3

**Term(s) to be offered:** Spring

**Prerequisite:** CIVE 322/ENVE 322, Basic Hydrology (or concurrent registration); ENGR 510/MATH 510, Linear Programming and Network Flows (or concurrent registration).

**Catalog description:** Applications of systems analysis and optimization techniques in water resources planning and management. .

**Instructor:** Darrell G. Fontane, Engr. B-213, Phone: 491-5248

**Text:** Class Notes

**Course Objectives:** The goal of this course is to introduce participants to general concepts of systems analysis and systems engineering as they apply to the planning, design and operation of water resources systems. The course focuses on the use of computer-based mathematical models for analyzing water resources systems. Students are exposed to a variety of example applications of systems analysis to water resources problems.

Upon completion of this course, the student should be able to:

- Understand and apply the systems approach for analyzing basic water resources problems.
- Understand the process of designing and applying simulation and optimization models for water resources management.
- Develop operational guidelines for single and multi-purpose reservoirs.
- Develop reservoir operational guidelines specifically for water quality purposes.

#### **Course Topics/Weekly Schedule:**

<b>Week</b>	<b>Topic</b>
1.	Water Resources Systems Analysis: Basic terminology and concepts of systems analysis, modeling, simulation approaches and optimization approaches;
2-4.	Single Reservoir Simulation: Developing and applying reservoir simulation models for design and operational analysis based on single and multiple objectives;
5.	Multiple Reservoir Simulation: Developing and applying reservoir simulation models for multi-reservoir systems for operational analysis based on single and multiple objectives;
6.	Reservoir Selective Withdrawal Structure Operation: Basic concepts of selective withdrawal structure operation and models used to operate these structures;
7.	Reservoir Water Quality Simulation: Basic terminology and concepts of reservoir water quality modeling;
8-9.	Multi-Criterion Decision Analysis: Basic terminology and concepts of multi-criterion decision analysis, examples of application to water resource systems;
10-12.	Optimization Applications in Water Resources: Application of Linear, Non-linear and Dynamic Programming technologies to problems in water resources, basic concepts of Dynamic Programming;
13-15.	Reservoir Optimization: Developing and applying reservoir optimization models for design and operational analysis based on single and multiple objectives, comparison to simulation approaches, combining multi-objective optimization with multi-criterion methods.

**Instructional Methodology:** Two lectures and one laboratory per week.

**Mode of Delivery:** Traditional lectures in class and via the course website for distance students.

**Methods of Evaluation:** The course grade will be based on the following distribution:

Homework	35%
Project	15%
Midterm Exam	25%
<u>Final Exam</u>	<u>25%</u>
	100%