

Colorado State University
Department of Civil and Environmental Engineering
Spring 2018
CIVE 423 – Groundwater Engineering



Instructor: Dr. Ryan Bailey
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Office location: Engineering A207-A
Office hours: M-W 11:00 am – 12:00

Class Time: MWF 2:00 – 2:50 pm
Class Location: Engineering B-101

Class Website: <http://info.canvas.colostate.edu/login.aspx/> The Canvas website will be used to post homework assignments, additional instructional material, announcements, etc.

Required Text: There is no required text for this course. Lecture material and homework problems will be taken from a variety of sources (textbooks, software programs, technical reports, etc.). Some excellent reference textbooks are:

- *Groundwater* (Freeze and Cherry)
- *Applied Hydrogeology* (Fetter)
- *Groundwater Hydrology* (Todd and Mays)
- *Groundwater Science* (Fitts)
- *Fundamentals of Ground Water* (Schwartz and Zhang)

Prerequisites: CIVE 300 or CBE 331 or WR 416

Course Description: Development of groundwater resources; origin, movement, distribution of water below groundwater surface; water quality; remediation.

Objectives: Familiarize students with concepts, terminology, chemistry, and math skills required to solve basic groundwater problems.

Topics Covered:

- Overview of groundwater distribution and use (historical and current)
- Storage and transmission of groundwater
- Groundwater interaction with surface water
- Estimating aquifer parameters
- Analytical and Numerical Modeling
- Pumping (steady-state, transient) effects on groundwater
- Groundwater system design (well fields, drainage systems)
- Groundwater quality and chemical transport
- Groundwater contamination and remediation

Teaching Philosophy: The successful completion of this course requires your attention, hard work, and respect. In return, I will strive to create a classroom setting that encourages learning, critical thinking, and respect for all students. I will endeavor to meet your academic needs, and as such encourage all students to take advantage of the weekly office hours. **I enjoy helping students outside of the classroom.** However, please be respectful of my time, as I have other duties to perform within the department.

I teach mainly with board notes, with powerpoint slides used to assist with visualizing the physical problem.

Academic Integrity: This course adheres to the Academic Integrity Policy of the Colorado State University General Catalog (Page 7) and the Student Conduct Code. Academic dishonesty is extremely serious. University rules, including academic penalty and further investigation by the university authorities, will be strictly enforced in this course. Please review the CSU Student Code for details regarding these rules. Copying from another student's homework assignment or exam may lead to dismissal from the course.

Reading: You are expected to come to class having read any assigned text or paper.

Projects (Homework):

This class uses a project-based learning approach for all material. There will be approximately 8-9 projects throughout the semester, accompanied by a set of lectures and other material to assist with learning theory and being able to complete the project. Project assignments are treated as homework. You may collaborate on the assignments, but each student must write and submit their own work. Copying is not allowed! See attached sheet for requirements of project submission (points will be taken off for failing to meet these guidelines).

Late projects will be accepted, although the score will be decreased by 25% of the total possible points for each week day that the assignment is late.

Also, I reserve the right to change the order or content of the projects at any time during the semester.

Field Labs: There will be 1-2 field labs during the semester. These will take place at the GetWET observatory (<http://getwet.colostate.edu/>) (just south of the Hilton along Spring Creek). These labs provide hands-on experience in taking water level measurements and groundwater samples for chemical analysis. More information (timing, logistics) will be provided as the semester progresses. Each field lab will require a 1-page summary of the techniques, to be turned in the following lecture.

Exams: Exams consist of two in-class mid-terms and a final (scheduled for **Tuesday, May 8 at 7:30 am**). Exams will be closed book, with 1 sheet (front and back) of notes and equations. You may use note sheets from previous exams. Exams will consist of both non-quantitative (i.e. short answer) and quantitative sections, and will cover material from lectures and projects.

Makeup exam policy: For students who cannot attend regular exams due to university business duty, serious illness, or family emergency (all with written proof), a makeup exam may be arranged AFTER the regular exam. The instructor must be notified prior to the exam, and no exceptions will be made without a legitimate reason and a timely arrangement.

Course Grading:

The grading breakdown is as follows:

- Projects (8-9) 45%
- Field Labs (1-2) 5%
- Exams (3) (1) 15% , (2) 15%, (Final) 20%

Term grades for this course will use the ± grading system as described in the CSU catalog. Grades will be assigned according to the following range:

90 – 100%	A
80 – 89%	B
70 – 79%	C
60 – 69%	D
< 60%	F

This range will not be shifted up. However, it may be shifted down based on relative difficulty of homework exercises and exams. If, at the end of the semester, a student’s score is 0.5% from a higher grade, then that student will receive the higher grade **if** the student’s semester homework score is higher than the student’s overall semester score.

Tentative Weekly Schedule

Week	Topic	Projects	Field Labs	Exams	Readings
1/15/2017	Introduction to Groundwater	1			<i>As assigned...</i>
1/22/2017	Geology, Finding Groundwater				
1/29/2017	Groundwater Energy	2	Lab #1		
2/5/2017	Aquifer Storage Properties	3			
2/12/2017	Groundwater Flow, Modeling	4			
2/19/2017	Groundwater Modeling (Analytical)				
2/26/2017	Groundwater Modeling (Analytical)	5			
3/5/2017	Effects of Pumping	6		Exam #1	
3/12/2017	Spring Recess				
3/19/2017	Effects of Pumping				
3/26/2017	Well Field Design / Prod. Wells	7	(Maybe) Lab #2		
4/2/2017	Dewatering				
4/9/2017	Estimate Aquifer Parameters	8		Exam #2	
4/16/2017	Modeling with MODFLOW				
4/23/2017	Groundwater Quality	9			
4/30/2017	Groundwater Quality				
5/8/2016	Final Exam: 7:30 am				