

21-460-427: Hydrogeology Spring 2019 Syllabus

Instructor: Dr. Lee Slater

Office: 140a Smith Hall

Office Hours: T, 2:00 pm – 3:00 pm

Meeting Time: 9:00 am to 2:00 p.m. T – Smith 127

Course Description

This course will present an overview of the parameters and mechanisms that control groundwater flow and solute transport. We will examine the controls on groundwater flow from the pore-scale up to the regional-scale. Standard methods used to model and predict groundwater flow will be introduced. Classic regional aquifer systems will be examined on a case-study basis. Hydrogeological science continues to evolve as new methods are developed and concerns regarding groundwater supply and quality increase. New techniques will be introduced and key aspects of contaminant hydrogeology explored. The labs will include problem sets, laboratory measurements, computer modeling and fieldwork. These components will help provide an integrated overview of groundwater science. Student participation in the class will be actively encouraged.

This year we will try to incorporate some field exercises/activities from a small well cluster that we have installed at a site in the NJ Meadowlands with the assistance of the Meadowlands Environment Research Institute (MERI). The cluster should allow us to demonstrate [1] shallow drilling techniques and ground installation, [2] how to estimate the direction of dominant groundwater flow from triangulation around three wells, [3] monitoring of groundwater levels and salinity changes, and [4] how to perform a slug test to estimate permeability.



Rutgers University Newark Geotool collecting soil cores in the NJ Meadowlands

Learning Objectives

The primary learning objectives for this course include:

- Understanding of physical factors controlling groundwater transport in porous media
- Competence in applying simple analytical solutions of steady state and transient flow scenarios to real world hydrogeological problems
- Acquire skills in groundwater modeling and be able to construct and execute a 2D flow model using analytical elements
- Able to perform pumping test analysis using both curve matching and computer techniques
- Recognition of the relevance of hydrogeology to public health and safety
- Ability to be able to present and defend hydrogeological datasets

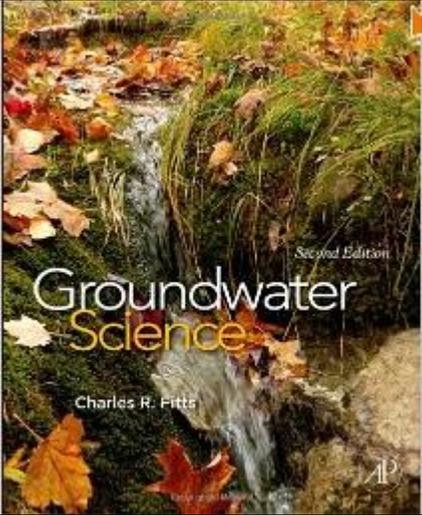
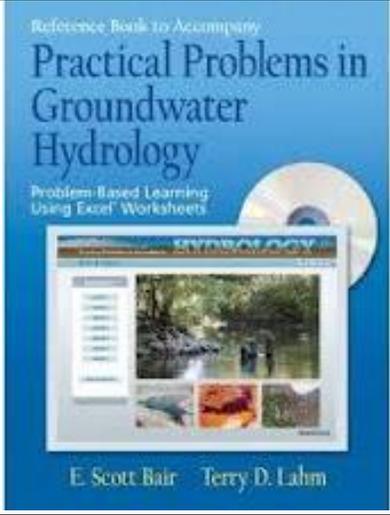
Topics Covered [in chronological order]:

Groundwater: The big picture
Physical properties
Principles of flow
Geology & groundwater flow
Deformation and storage
Modeling steady flow - basics
Modeling transient flow - basics
Computer assisted flow modeling

Texts:

The **highly recommended** text for the lecture component of this class is:
Fitts, C.R., 2012, Groundwater Science, Second Edition, Academic Press, ISBN-10: 0123847052

The **required** laboratory book is:
Bair, S. and Lahm, T.D., 2006, Practical Problems in Groundwater Hydrology, Prentice Hall, 168 pp
Note: you must own a personal copy of this lab book to participate in some of the laboratory exercises used in this course.

	
<p><i>Recommend for the lecture component</i></p>	<p><i>Required for the lab component</i></p>

Other good Hydrogeology texts include:

Schwarz, F.W. and Zhang, H., 2002, Fundamentals of Groundwater, Wiley, ISBN 0471137855
Fetter, C.V. 2001, Applied hydrogeology, Fourth edition, Prentice Hall, ISBN 0130662399

Your Assignments

- *Take home assignments:* You will need to write up your labwork - due in class the following week†
- *Written paper:* written in the format of a scientific journal
- *Mid-term:* in class (closed-book) format – time TBA
- *Final:* (closed book) format – time determined by Rutgers Exam Schedule
- *Quick quizzes:* in-class (closed book) format

†Write ups of the laboratory work must be submitted via Blackboard prior to 9 am of the following Tuesday (class day). All labs must be submitted electronically and show all calculations. I will not accept hand-written assignments or late assignments.

Assignments cannot be submitted late for grading – students that do not submit the assignment prior to the following class will get a 0 for that assignment.

Grading:

The breakdown for the grading is as follows.

- *Take home assignments/lab write-ups:* 30%
- *Written paper:* 10%
- *Mid-term:* 25%
- *Final:* 25%
- *Quick quizzes:* 10%

SERIOUS STUFF:

Exam days: We will have a midterm on Tuesday March 12. We will have a final exam during the week of finals. These are serious exams and you should turn up on time. During the 2-3 hour exam you will not be able to leave the room so make sure to go to the bathroom beforehand.

Americans with Disabilities Act Statement: If you need accommodations because of a documented disability, contact the Disabled Student Services Office on x5300

Academic Honesty Policy: Cheating in any form will not be tolerated. The first occurrence of any of this behavior will result in a grade of "F".