

Spring 2020

General Hydrogeology

INSTRUCTOR

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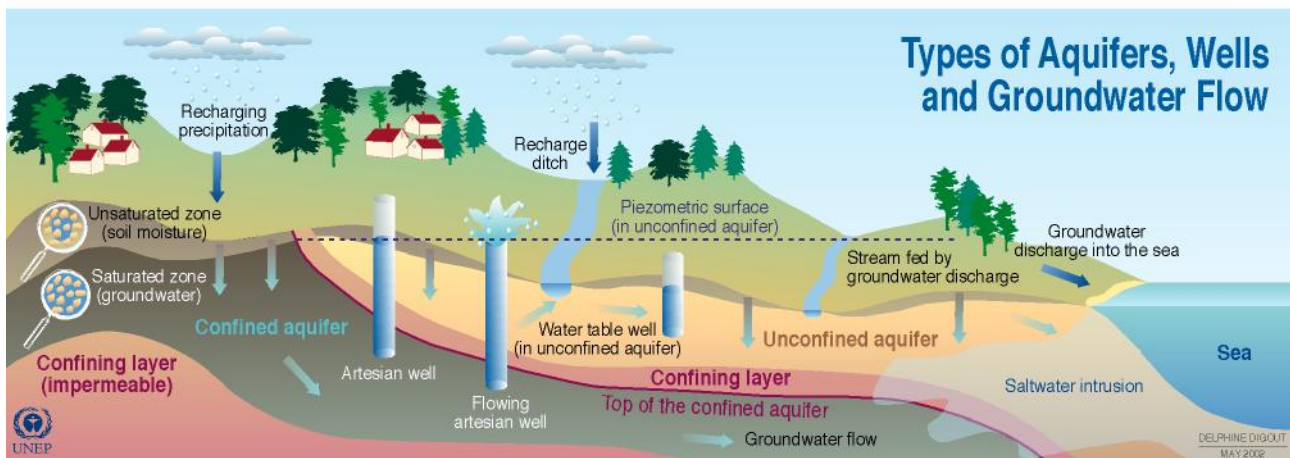
MEETING PATTERN & LOCATION

MW, 10:30-11:50 am (3 credits), Geology Building 302

COURSE DESCRIPTION

The overall objective of this course is to provide an introduction to the basic principles of the hydrologic cycle and groundwater flow. The course will emphasize flow in confined and unconfined aquifer, pump test design and analysis, the transport of contaminants and the use of computer models to simulate saturated groundwater flow. We will also perform simple experiments to better understand the concepts of groundwater flows and pump tests. Case studies for groundwater contamination and remediation will be also discussed.

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Source: Environment Canada, 2001 (Adapted from: <http://www.ec.ca/water/index.htm>).

COURSE OBJECTIVES

- 1) Learn the Darcy's law, which describes how water flows through a porous media.
- 2) Understand the main equations of flow, which are conservation statements for steady-state and transient conditions.
- 3) Study the hydraulic testing methods, primarily pumping tests, which are used to determine the hydraulic properties of a water-bearing rock unit.
- 4) Learn the principles of aqueous geochemistry that pertains to groundwater systems.
- 5) Learn the concepts in contaminant hydrogeology including transport phenomena and remediation.

REQUIRED TEXTBOOK

Applied Hydrogeology, by Fetter, C.W., 4th ed., Prince Hall, Upper Saddle River, NJ.
Hydrogeology Laboratory Manual (provided in class), by Lee, K.,
http://www.amazon.com/Hydrogeology-Laboratory-Manual-2nd-Keenan/dp/0130465496/ref=pd_cp_b_0 - # Fetter, C.W., and McCray, J.E.

RECOMMENDED READINGS

Groundwater, by Freeze, R.A. and Cherry, J.A., 1979, Prentice Hall, Inc., Upper Saddle River, NJ.
Hydraulics of Groundwater, by Bear, J., 1979, Dover Publications, Inc., Mineola, NY
Contaminant Hydrogeology, by Fetter, C.W., 2nd ed., Waveland Press, Inc., Long Grove, IL

GRADING:

Homework sets and lab assignments: **40%**; Mid-term and final exam: **50%**; Attendance: **10%**.
A-100-85%; B- 84-75%; C-74-65%, D- 64-55%; F-below 55%.

TENTATIVE SCHEDULE OF TOPICS – *updates coming soon!*

Week	Topics	Reading assignments
1	Introduction and Hydrologic cycle	T1-18, 24-55, 93-99
2	Hydrologic equations and water budget	Handout
3	Darcy's law, generalization to multiple dimensions, aquifer properties	T90-93, 113-125, 66-90, handout
4	Confined and unconfined aquifers	T125-129, 138-139, 140-146
5	Application to confined and unconfined aquifers	Handout
6	Flownets, Midterm review, Midterm exam	T132-138, handout
7	Radial flow and applications	T150-165, handout
8	Superposition and Pump tests	T166-184, 184-190
9	Slug tests and applications	T190-209, handout
10	Transport processes, contaminant properties	T400-415, 415-426
11	Contaminant transport and mass balance equations	Handout
12	Analytical solutions and applications	Handout
13	Pump and treat remediation, capture zones	T426-435, 436-439
14	Case study: groundwater contaminant	Handout
15	Groundwater environment, numerical modeling, review for final exam	T283-322, 514-530,
16	Final exam week	