Spring 2024
General Hydrogeology

GEOL 4383/GEOL 5317/GEOL 6340

In person class
Synchronous lectures/discussion, modeling work, and problem solving

INSTRUCTOR
Dr. **Lin Ma**
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University of Texas at El Paso
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MEETING PATTERN & LOCATION (Three credit hours)

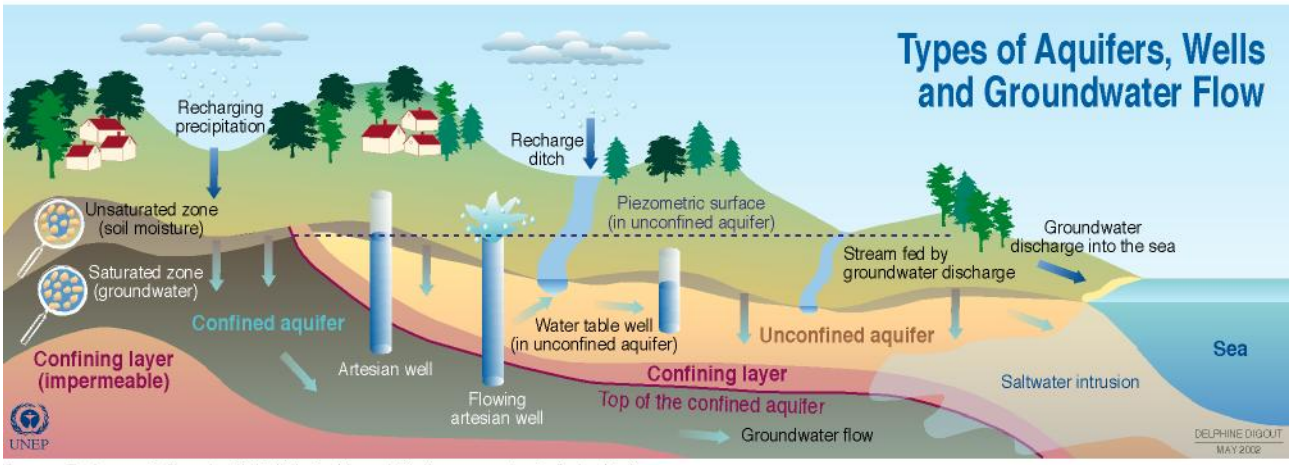
Tuesdays and Thursdays 9:00-10:20am, Geology Building 302

Geology Building Computer Lab 409 (Modeling work and problem solving with advance notices)

Office hour/individual meetings: email appointments

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 perform simple model simulations to better understand the concepts of groundwater flows and pump tests. Case studies for groundwater contamination and remediation will be also discussed.



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.

ELECTRONIC RESOURCES

- **Visual MODFLOW Flex (DEERS has a license to use for PCs in Room 409)**

Groundwater flow & contaminant transport modeling software
https://www.waterloohydrogeologic.com/products/visual-modflow-flex/

Software Manual
https://www.waterloohydrogeologic.com/help/vmod-flex/

MODFLOW Tutorials
https://www.waterloohydrogeologic.com/support/visual-modflow-flex-tutorials/

- **Hydrolearn**

https://www.hydrolearn.org

- **The groundwater project provides free groundwater books on a series of topics**

https://gw-project.org/books/

RECOMMENDED ADVANCED 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: **60%**; Mid-term and final exam: **30%**; 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	MODFLOW Introduction	T283-322, 514-530
7	MODFLOW tutorial 1	Handout
8	MODFLOW tutorial 2	Handout
9	Regional aquifer MODFLOW project: define problem	Handout
10	Regional aquifer MODFLOW project: define approaches	Handout
11	Wells: Radial flow and applications	T150-165, handout
12	Superpostion and Pump tests	T166-184, 184-190
13	Slug tests and applications	T190-209, handout
14	Pump and treat remediation, capture zones	T426-435, 436-439
15	Case study: groundwater contaminant	Handout
16	Final exam week	

Students with Disabilities

If you have a disability or if you are experiencing learning difficulties, please contact the Center for Accommodations and Support Services (CASS) or visit their portal (cassportal.utep.edu). You may contact them Monday through Friday 8:00a.m.-5:00p.m. Phone:(915) 747-5148. Union Building East Room 106 cass@utep.edu. They provide any necessary accommodations. You should also meet with me in order to facilitate your needs. You are expected to provide documentation of your disability in order to make special arrangements in this class.

Academic Misconduct

Academic dishonesty will be not tolerated in this class (please refer to the student conduct code handbook for details regarding university policy and definitions). Dishonesty includes, but is not limited to, plagiarism on term papers, unauthorized notes brought into an exam; copying answers from another student or letting another student copy your answers. The penalty for the first offense will be a grade of zero points on the exam or assignment. Penalty for the second offense will be an F for the course.

Campus Carry

Persons holding a Concealed Handgun License can lawfully carry their handgun into a UTEP classroom as long as the gun remains concealed. Open carry remains prohibited on campus. In other words, none of us should see (or be able to tell that there is) a gun at UTEP. Call the University Police at 747-5611 or dial 911 if you see any individual on campus with a handgun or other type of weapon. For more information on campus carry, see [http://sa.utep.edu/campuscarry/]; for more information on overall campus safety, see [http://admin.utep.edu/emergency].