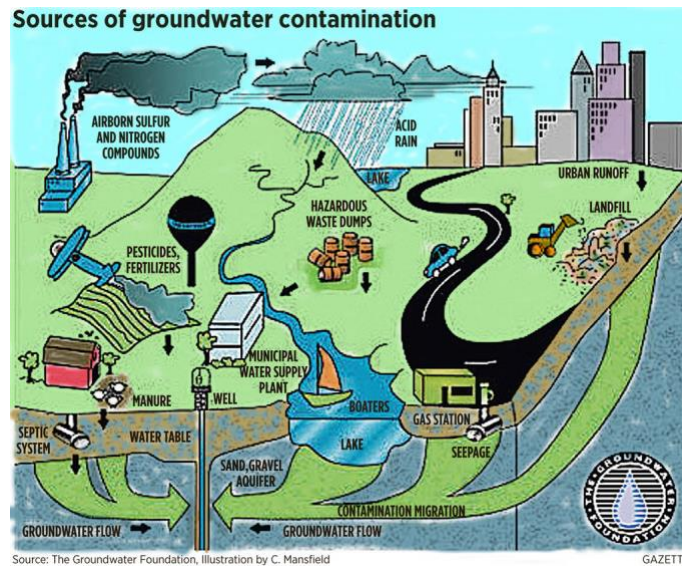


Fall 2023
GEOL 4373
GEOL 5315/6315

Groundwater Contamination and Reclamation



INSTRUCTORS

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MEETING PATTERN & LOCATION

TR, 9:00-10:20 am (3 credits), Geology Building 302

Office hours: M 9-10 am (for both Dr. Ma and Dr. Engle) or by email appointments

COURSE DESCRIPTION

The overall objective of this course is to introduce basic principles of contamination fate and transport in groundwater. The course will emphasize mass transport and contaminant transport in confined and unconfined aquifers and the vadose zone, and the use of conceptual and analytical models

to simulate fate and transport in saturated and unsaturated groundwater conditions. We will also include the application of remediation and reclamation methods for various types of contaminants.

COURSE OBJECTIVES

- 1) Learn the concepts in contaminant hydrogeology including transport phenomena and remediation.
- 2) Learn the Darcy's law, which describes how water flows through a saturated porous media.
- 3) Understand the main equations of flow and mass (contaminants), which are conservation statements for steady-state and transient conditions.
- 4) Learn the general principles of flow and transport in unsaturated zone, including Richard's equation.
- 5) Discuss the characterization and remediation of contaminated sites for groundwater and vadose zone systems, the superfund law, preliminary site assessment, site investigation techniques, and remediation technologies, and monitoring requirements.

REQUIRED TEXTBOOK

Contaminant Hydrogeology, by Fetter, C.W., 3rd ed., Waveland Press, Inc., Long Grove, IL

RECOMMENDED READINGS

Applied Hydrogeology, by Fetter, C.W., 4th ed., Prentice Hall, Upper Saddle River, NJ.

Hydraulics of Groundwater, by Bear, J., 1979, Dover Publications, Inc., Mineola, NY.

Unsaturated Zone Hydrology for Scientists and Engineers, by Tindall, J.A., and Kunkel, J.R., 1999, Prentice Hall, Upper Saddle River, NJ.

If you have not taken course GEOL 4383, General Hydrogeology, you should review basic principles of the subject in the recommended readings above.

TENTATIVE SCHEDULE OF TOPICS – *subject to change!*

Week	Topics	Textbook chapters
1	Introduction, Groundwater contamination, Review of hydrogeology	Ch. 1
2	Mass transport in saturated media Darcy's Law, Permeability, Porosity	Ch. 1
3	Bernoulli's equation and hydraulic head; common aquifer materials and properties	Ch. 1
4	Transmissivity, Storativity, Groundwater continuity equation	Ch. 1
5	Mass transport in saturated media: advection, diffusion	Ch. 2
6	Dispersion and the advection-dispersion equation	Ch. 2
7	Fate of solutes: sorption and isotherms	Ch. 3
8	Fate of solutes: sorption, transformation, retardation, and attenuation	Ch. 3
9	Introduction to numerical groundwater modeling w/ hands-on tutorial	Handout
10	MODFLOW continued/Vadose zone hydrology - concepts	Ch. 4
11	Water retention curves; Richard's equation; Modeling water flow with HYDRUS 1-D	Ch. 4/Handout
12	Intro to solute transport in the vadose zone	Ch. 4/Handout
13	Unsaturated zone solute transport/Multiphase Flow	Ch. 4/5

14	Source control, pump and treat	Ch. 8/Handouts
15	Remediation methods	Ch.9/Handouts
16	Final exam week	

Aqueous geochemistry and sources of solutes/ Organic compounds in groundwater

Grading: Exams (40%: one mid-term and one final exam/class project); Homework (40%); Attendance or active class participation (20%);

Grading scale:

A: 100-90%; B: 89-80%; C: 79-70%, D: 69-60%; F: below 60%.

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>].