

# GROUNDWATER HYDROLOGY

ECI-144, Winter Quarter (4 units)

**Instructor:** Verónica L. Morales (vermorales@ucdavis.edu)

**Meeting times:** TBD

**Office hours:** TBD, 3136 Ghausi Hall

**Course description:** Principles of subsurface hydrology; physics of groundwater distribution and movement; well hydraulics, aquifer testing and water supply; introductory groundwater chemistry and contamination, subsurface mass transfer processes, subsurface solute fate and transport.

**Pre-requisites (or equivalent):** Working knowledge of algebra, calculus and water chemistry. Energy, enthusiasm, and willingness to learn and/or improve critical programing skills.

**Content:** The course involves study of selected topics from the following

- Hydrology and Hydrogeology
- The hydrologic cycle
- Basic properties of aquifers/porous media
- Darcy's Law
- The flow equation: initial conditions, boundary conditions, uncertainty
- Field measurements
- Uncertainty
- Heterogeneity of aquifers
- Flow to wells
- Building conceptual and numerical models
- Vadose zone
- Water quality and groundwater contamination
- Advection, Diffusion, Dispersion, Chemical reactions
- Solutions to the Advection-Dispersion (Reactive) Equation

**Evaluation:** Homework (30%), Midterm (30%), Final (%40)

**Learning outcomes:** My goal for this course is for you to

- comprehend the basic concepts and techniques used in groundwater hydrology
- understand how to gather and use information to apply the learned concepts outside of class
- develop skills to approach complex problems that do not have a *single* correct answer
- think critically, observe broadly, and apply educated judgement to make decisions

**References (select chapters from):**

- Charbeneau. *Groundwater hydraulics and pollutant transport*. Waveland Press, 2006 (Amazon, bookstore).
- Freeze & Cherry. *Groundwater*. Printice-Hall Inc, Englewood Cliffs, 1979 (Free online PDF, Amazon).
- Fetter. *Applied hydrogeology*. Prentice hall, 2000. (Free online PDF, Amazon).
- Various other online readings (Canvas).