SELECT TOPICS OF TRANSPORT AND FATE THROUGH POROUS MEDIA

ECI-289I, Fall Quarter (4 units)

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

Meeting times:
TBD

Office hours:
TBD, 3136 Ghausi Hall

***Course description*:**
Solute and colloid mass transport processes in porous media. Characterizing and quantifying physical processes of advection, diffusion/dispersion, as well as basic biogeochemical reactions. Colloid-facilitated transport in porous media. Analytical and numerical solutions to the reactive advection-dispersion equation in Eulerian and Lagrangian forms.

***Pre-requisites (or equivalent courses)*:**
Upper division standing. ECI-144, solid foundation in calculus, ability to program

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

- Groundwater flow review
- Advection, dispersion, retardation processes and ADE (Goltz)
- Equilibrium vs kinetically-controlled reactions (Fetter, HYDRUS lab)
- Analytical solutions (Goltz)
- Preferential and Nonequilibrium Flow and Transport (Fetter, HYDRUS lab)
- Continuous-time random walk models (Berkowitz, Dentz, Matlab lab)
- Mixing processes and mixing driving reactions (Bolster, Matlab lab)
- Percolation theory (Hunt)
- Colloid transport, filtration theory with DLVO interactions (Borkovec)

Evaluation:
Homeworks & lab assignments (70%), written review and presentation (20%), class participation (%10)

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

- comprehend the basic concepts and techniques used to study contaminant transport
- gain an understanding of the natural processes controlling contaminant fate and transport
- acquire some diverse modelling techniques that can be used to approach complex problems

References (select chapters from):

- C.W. Fetter. *Contaminant hydrogeology*. Prentice-Hall, Inc. 1999.
- M. Goltz and J. Huang. *Analytical Modeling of Solute Transport in Groundwater: Using Models to Understand the Effect of Natural Processes on Contaminant Fate and Transport*. Vol. 1. John Wiley & Sons, 2017.
- A. Hunt, R. Ewing and B. Ghanbarian. *Percolation theory for flow in porous media*. Vol. 880. Springer, 2014.