SYLLABUS – GEO 572
Advanced Hydrogeology

Schedule: M, W, F 11:00-12:00, CCHB 333
Instructor: W. Payton Gardner, CCHB 353
Office hours: by apt.

Course Description: In this class we will develop a fundamental understanding of processes controlling the movement of groundwater, dissolved species and thermal energy in the subsurface. We will identify the fundamental processes which govern coupled groundwater, heat and chemical transport, derive the partial differential equations which describe them and methods of quantitative solution and simulation of these systems. The final goal is to develop quantitative, multi-physics models of groundwater, heat and solute transport in subsurface systems.

Grading: 100-90 A, 89-80 B, 79-70 C, 69-60 D, 59 or less F

Weighting:

Assignments:	45%
Final Project:	45%
Field Trip:	10%

Students will be evaluated on their ability to master the topics covered and their participation in class. The ability of students to learn and apply the concepts presented will be evaluated with assignments and a final project which will require much of the material covered in class. This is a fast-paced quantitative class, there will be lecture and in class work in the computer lab. Don't miss class, and stay up on your reading. **Don't** expect to be able to finish the homework the night before its due - start working on it as soon as you get it. Homework should be clean, clear and edited. It will be turned in at the start of class the day it is due.

Final Project:
The final project will be a modeling investigation of the thermal remediation treatment at George's Conoco in Ronan. The final project will be a coauthored paper by all the students on a novel aspect of our simulation. The potential for the paper to actually be published, and the actual science behind the paper will be up to the motivation and talent of the class, with the help of me of course. The objective is for students to utilize the fundamental understanding developed in this class towards simulating a complex engineering project, and end with scientific communication of the results.

Schedule of Topics:

Week	Topic	Reading/Deadlines
1 8/27	Introduction to Transport, Conductive Heat flow	T&S Ch. 4 Chapman papers
2 9/3	Transient Conductive Heat flow	HW 1
3 9/10	Advection/Convection	Ingeb. Ch 4.
4 9/17	Transient Advective/Conductive heat flow	HW2
5 9/24	Intro to Solute Transport	Ingeb. Chap 3. (GSA)
6 10/1	Diffusion /Diffusive transport	HW3 Mazurek/Hendy
7 10/8	Advective/Dispersive Mass Transport	Gardner/
8 10/15	Intro to Reactive Mass Transport	HW4
9 10/22	Ronan Model Development – Intro to PFLOTRAN	Lit. Summary
10 10/29	Ronan Model Development – Developing flow model	Paper – Concept Map
11 11/5	Ronan Model Development – Developing thermal model	Paper – Intro
12 11/12	Ronan Model Development – Developing MTBE transport model	Paper – Site
13 11/19	Ronan Model Development – Calibration	Paper – Methods
14 11/26	Ronan Model Development – Uncertainty	Paper – Results
15 12/3	Ronan Model Development – Predictive Uncertainty	Paper - Conclusions
	Final Exam - Wednesday December 14th - 3:20	AGU