Instructor: Alan Fryar, 212-A Slone (e-mail afryar1@uky.edu, phone 257-4392, fax 323-1938)  
Office hours: drop in or by appointment


Reserves in Pirtle Geology and Map Library (410 M.I. King Library):

W. Back, J. S. Rosenshein, and P. R. Seaber (eds.), 1988, Hydrogeology: Geological Society of America,  
Decade of North American Geology, v. O-2
D. C. Ford and P. W. Williams, 1989, Karst Geomorphology and Hydrology
R. A. Freeze and J. A. Cherry, 1979, Groundwater
(also available for purchase in the KGS Publication Sales Office, 106 MMRB)

Course content and activities:

This course will address the occurrence, movement, and reactions of water within the Earth’s subsurface.  
We will emphasize the evaluation of flow directions and rates, the calculation of hydraulic properties, and  
the conceptual understanding of mass transport.

- Attendance is expected, but copies of my notes will be available.
- There will be at least two field trips: a Saturday trip in March to view karst features in the Lexington  
area, and a Friday afternoon – Sunday afternoon trip in April to Kentucky Lake (dates TBA). An  
additional local field trip is possible.
- Lectures and homework (including some computer-based exercises) will draw upon case studies  
and practical examples. Homework will count 25% of the final grade.
- Both the midterm (March 3) and final (May 5) will be open book and will include questions from field  
trips, videos, and/or departmental seminars (which I will publicize). I will distribute a review sheet  
about a week before each exam. The final will be cumulative but will focus on the second half of the  
course. Each exam will count 25% of the overall grade.
- A term paper on a topic of hydrogeologic interest is due April 26. This will be graded on scientific  
content, clarity of expression (including grammar, spelling, and punctuation), and bibliographic  
format. I will distribute a list of suggested (but not mandatory) topics approximately one month in  
advance. The paper will count 20% of the overall grade for grad students and 25% for undergrads.
• Grad students will make oral presentations based on their term papers. These presentations, which will be evaluated by the class and me for scientific content and clarity of expression (including use of audio-visuals), will count 5% of the overall grade. Undergrads will be able to make oral presentations for 5% extra credit but must let me know at least a week in advance. Presentations will be scheduled in alphabetical order by last name.

• Late penalties for homework and papers will be 5% per day if unexcused. Overall grades will be assigned as follows: 90 and above = A; 80–89 = B; 70–79 = C; 60–69 = D; below 60 = E [no D for grad students]; curving is possible.

Schedule (subject to revision; chapters refer to Schwartz and Zhang):

Week 1 (Jan. 14, 16):
Introduction; the hydrologic cycle (Chapter 1)

Week 2 (Jan. 21, 23)
Hydrologic processes at the Earth’s surface (Chapter 2)

Week 3 (Jan. 26, 28, 30)
Hydrologic processes at the Earth’s surface (continued); porosity; Darcy’s law and ground-water flow; hydraulic conductivity (Chapters 2–3)

Week 4 (Feb. 2, 4, 6)
Aquifers and confining units; transmissive and storage properties; stress distributions in porous media; mapping ground-water flow (Chapter 4)

Week 5 (Feb. 9, 11, 13)
Geology and hydraulic properties (regional hydrogeology); porous vs. fractured media (Chapter 4)

Week 6 (Feb. 16, 18, 20)
Differential equations of ground-water flow; compaction, compressibility, and subsidence; flow nets; flow in the unsaturated zone (Chapters 5–6)

Week 7 (Feb. 23, 25, 27)
Flow in the unsaturated zone (continued); drilling techniques, piezometers, and wells (Chapters 6–7)

Week 8 (Mar. 1, 3, 5)
Review Mar. 1; midterm Mar. 3; response of confined aquifers to pumping (Chapter 9)

Week 9 (Mar. 8, 10, 12)
Response of confined aquifers to pumping (continued); leaky confined aquifers (Chapters 9–10)
Spring break week of Mar. 15

Week 10 (Mar. 22, 24, 26)
Response of unconfined aquifers to pumping; slug tests; superposition (Chapters 11–13)

Week 11 (Mar. 29, 31, Apr. 2)
Regional ground-water flow (Chapter 8)

Week 12 (Apr. 5, 7, 9)
Regional ground-water flow (continued); dissolved mass in ground water; kinetic and equilibrium reactions (Chapters 8, 16, 17)

Week 13 (Apr. 12, 14, 16)
Reactions influencing ground-water chemistry; geochemistry of natural water systems (Chapters 18, 21)

Week 14 (Apr. 19, 21, 23)
Reactions influencing ground-water chemistry; geochemistry of natural water systems (continued) (Chapters 18, 21); Fryar seminar 4/22 (Thursday), 4:00 PM

Week 15 (Apr. 26, 28, 30)
Term paper due Apr. 26; term paper presentations; review and evaluations

Final exam: Wed., May 5, 8:00–10:00 AM