



Title: Physical Hydrogeology (GEO SCI 463/463G)

Term: Fall 2022

Credits: 4 Credits Undergraduate/Graduate

Description: Study of groundwater occurrence, its interrelationship with surface water, aquifer properties, groundwater flow and water supply development, including well hydraulics, water quality, and groundwater law

Duration: 3 hours lecture per week and 3 hours lab per week

Prerequisites: junior/senior status; GEO SCI 100(P) or GEO SCI 101(P); MATH 232(P).

Lecture: 1:00 PM to 2:15 PM, Mon. and Wed., Sept. 6 to Dec. 14, Lapham Hall, Room 262

Lab Section 801: 2:30 PM to 5:20 PM, Mon., Sept. 6 to Dec. 14, Lapham Hall, Room 262

Lab Section 802: 5:30 PM to 8:20 PM, Wed., Sept. 6 to Dec. 14, Lapham Hall, Room 262

Teacher: Dr. C.J. Paradis, E-mail: paradisc@uwm.edu, Office Hours, Lapham 348: Fri., 10:00 AM to 12:00 PM or by appointment

Teacher's Assistant: Rakiba Sultana, E-mail: sultanar@uwm.edu, Office Hours, Lapham 226, Tu. and Thu., 10:00 AM to 11:00 AM or by appointment

Textbook: Groundwater, R. Allan Freeze and John A. Cherry, 1979, ISBN 0-13-365312-9, free download at: <http://hydrogeologistswithoutborders.org/wordpress/original-groundwater-by-freeze-and-cherry-1979-now-available-online/>

Grading: 50% lab assignments, 10% pre-class assignments, 10% in class assignments, 10% mid-term exam, 20% final exam

Final Exam: Finals Week (exact day and time yet to be determined), Lapham Hall, Room 262

Graduate Student Requirement: Apply knowledge gained towards substantial advancement of your thesis or professional development

Time Investment: No less than 48 hours (lecture, laboratories, examinations, preparation, etc.) per 1 credit hour per semester, i.e., no less than $(4 \text{ credits}) \times (48 \text{ hour/credit}) = \underline{192 \text{ hours}}$ (≈ 13 hours/week)

Grading: A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D+ (67-69), D (63-66), D- (60-62), F (<60)

Course Schedule

Week of:	Lecture Topic	Textbook Chapter	Lab Assignment
9/5	M: No Class (Labor Day) W: Fundamentals	None	No Lab
9/12	M: Darcy's Law W: Darcy's Law	2.1 2.1	Particle Density (ρ_p) & Bulk Density (ρ_b)
9/19	M: Hydraulic Head & Conductivity W: Heterogeneity & Porosity	2.2, 2.3 2.4, 2.5	Porosity (n), Specific Yield (S_y) & Specific Retention (S_r)
9/26	M: Aquifers & Aquitards W: Steady & Transient Flow	2.7 2.8	Error Propagation of $\rho_p, \rho_b, n, S_y,$ & S_r
10/3	M: Compressibility & Stress W: Transmissivity & Storativity	2.9 2.10	Grain Size Distribution (d) Sieve and Hydraulic Conductivity (K)
10/10	M: Groundwater Flow Equations W: Groundwater Flow Equations	2.11 2.11	No Lab: Sat. Field Trip to Cedarburg Bog or Data Analysis
10/17	M: Limits to Darcy's Law W: Hydrodynamic Dispersion	2.12 2.13	Falling Head Permeameter (K) Homemade Apparatus
10/24	M: Mid-term Exam Review W: Mid-term Exam	2	Falling Head Permeameter (K) ASTM Apparatus
10/31	M: Aquifer Pumping W: Aquifer Pumping	8.3 8.3	Transient Pumping Test for Hydraulic Conductivity (K)
11/7	M: Laboratory Parameter Tests W: Piezometer Parameter Tests	8.4 8.5	Steady-State Pumping Test for Hydraulic Conductivity (K)
11/14	M: Pumping Parameter Tests W: Pumping Parameter Tests	8.6 8.6	Solute/Contaminant Transport (v, α)
11/21	M: No Class (Thanksgiving-ish) W: No Class (Thanksgiving Break)	None	No Lab
11/28	M: Numerical Simulations W: Numerical Simulations	8.8 8.8	Groundwater Flow Modeling
12/5	M: Groundwater Contamination W: Groundwater Contamination	9.2 9.2	Groundwater Flow Modeling
12/12	M: Final Exam Review W: Final Exam Review	2, 8, 9	No Lab



Syllabus COVID Statement

Panther Community Health and Safety Standards: UWM has implemented health and safety protocols, taking into account recommendations by local, state, and national public health authorities, in response to the COVID-19 pandemic. As a member of our campus community, you are expected to abide by the Panther [Interim COVID-Related Health & Safety Policy](#), which was developed in accordance with public health guidelines. These standards apply to anyone who is physically present on campus, UWM grounds, or participating in a UWM-sponsored activity:

- UWM recommends that all individuals visiting UWM facilities wear face coverings while indoors.
- UWM recommends getting vaccinated for COVID-19 and getting the most recent booster shot available to you.
- UWM requires that you check daily for COVID-19 symptoms and not come to campus if you are feeling sick. If you are feeling sick, get tested for COVID-19 and quarantine until symptoms subside. Use the [CDC Quarantine and Isolation Calculator](#) to determine next steps.
- If you test positive for COVID-19, UWM requires that you self-report at the [Dean of Students Reporting Form](#). Use the CDC Quarantine and Isolation Calculator to determine next steps.

Additional details about student and employee expectations can be found on the [UWM COVID19 webpage](#).