



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

**Term:** Fall 2021

**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:** 12:30 PM to 1:45 PM, Mon. and Wed., Sept. 2 to Dec. 14, In Person, Lapham Hall, Room 262

**Lab Section 801:** 3:30 PM to 6:20 PM, Mon., Sept. 2 to Dec. 14, In Person, Lapham Hall, Room 262

**Lab Section 802:** 3:30 PM to 6:20 PM, Wed., Sept. 2 to Dec. 14, In Person, Lapham Hall, Room 262

**Teacher:** Dr. C.J. Paradis, E-mail: paradisc@uwm.edu, Office Phone: 414-229-2493, Office Hours, In Person, Lapham 348: Fri., 10:00 AM to 12:00 PM or by appointment

**Teacher's Assistant:** Kendyl Hoss, E-mail: knhoss@uwm.edu, Office Hours, In Person, Lapham 332, Thu. 11:00 AM to 1:00 PM 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, 25% mid-term exam, 25% final exam

**Final Exam:** Mon., Dec. 20, 12:30 PM to 2:30 PM, 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 credits)\*(48 hour/credit) = 192 hours ( $\approx$ 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
8/30	M: No Class W: No Class	None	No Lab
9/6	M: No Class (Labor Day) W: Fundamentals	None	No Lab
9/13	M: Darcy's Law W: Darcy's Law	2.1 2.1	Particle Density ( $\rho_p$ ) & Bulk Density ( $\rho_b$ )
9/20	M: Hydraulic Head & Conductivity W: Heterogeneity & Porosity	2.2, 2.3 2.4, 2.5	Porosity ( $n$ ), Specific Yield ( $S_y$ ) & Specific Retention ( $S_r$ )
9/27	M: Aquifers & Aquitards W: Steady & Transient Flow	2.7 2.8	Error Propagation of $\rho_p$ , $\rho_b$ , $n$ , $S_y$ , & $S_r$
10/4	M: Compressibility & Stress W: Transmissivity & Storativity	2.9 2.10	Grain Size Distribution ( $d$ ) Sieve and Hydraulic Conductivity ( $K$ )
10/11	M: Groundwater Flow Equations W: Groundwater Flow Equations	2.11 2.11	Falling Head Permeameter ( $K$ ) Homemade Apparatus
10/18	M: Limits to Darcy's Law W: Hydrodynamic Dispersion	2.12 2.13	Falling Head Permeameter ( $K$ ) ASTM Apparatus
10/25	M: Mid-term Exam Review W: Mid-term Exam	2	Transient Pumping Test for Hydraulic Conductivity ( $K$ )
11/1	M: Aquifer Pumping W: Aquifer Pumping	8.3 8.3	Steady-State Pumping Test for Hydraulic Conductivity ( $K$ )
11/8	M: Laboratory Parameter Tests W: Piezometer Parameter Tests	8.4 8.5	Field Trip to Cedarburg Bog or Slug Test Data Analysis
11/15	M: Pumping Parameter Tests W: Pumping Parameter Tests	8.6 8.6	Solute/Contaminant Transport ( $v$ , $\alpha$ )
11/22	M: No Class (Thanksgiving-ish) W: No Class (Thanksgiving Break)	None	No Lab
11/29	M: Numerical Simulations W: Numerical Simulations	8.8 8.8	Groundwater Flow Modeling USGS Code & Software
12/6	M: Groundwater Contamination W: Groundwater Contamination	9.2 9.2	Groundwater Flow Modeling USGS Code & Software
12/13	M: Final Exam Review W: No Class	2, 8, 9	No Lab



## **Syllabus COVID Statement**

**Panther Community Health and Safety Standards:** UWM has implemented reasonable 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 Rules, which were 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:

- All individuals visiting UWM facilities must wear face coverings while indoors;
- Unvaccinated students coming to campus are required to test weekly for COVID-19; and,
- You should check daily for COVID-19 symptoms and not come to campus if you are feeling sick.

Additional details about student and staff expectations can be found on the [UWM COVID-19 webpage](#).