UNIVERSITY of WISCONSIN
UWMILWAUKEE

Title: Modeling Techniques for Hydrogeology (GEO SCI 730)

Term: Spring 2023

Credits: 3 Credits Graduate

Description: Study and application of modelling techniques in hydrogeology. Includes finite difference and finite element techniques for groundwater flow, contaminant transport, and geochemistry.

Duration: 1 hour lecture plus 1.5 hours computer lab per week

Prerequisites: grad st; Geo Sci 463; knowledge of fortran or equiv; cons instr.

Lecture: 8:30 AM to 11:10 PM, Fri., Jan. 23 to May 11, Lapham Hall, Room 262 (lecture) and Room 249 (computer lab)

Teacher: Dr. C.J. Paradis, paradisc@uwm.edu, Lapham 348

Textbook: None

Grading Weights: 40% mid-term project, 40% final project, 20% participation

Grading Scale: 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)

Final Exam: None

Time Investment: No less than 48 hours (lecture, laboratories, examinations, preparation, etc.) per 1 credit hour per semester, i.e., no less than (3 credits)*(48 hour/credit) = 144 hours (≈9 hours/week)

Course Schedule

Week of:	Lecture Number
1/23	1: Darcy's Law and Laplace Equation
1/30	2: Finite Difference Steady-State Flow Confined Aquifer (Laplace)
2/6	3: Finite Difference Iterative Solutions
2/13	4: Finite Difference Steady-State Flow Confined Aquifer with Source/Sink Terms (Poisson)
2/20	5: Finite Difference Steady-State Flow Unconfined Aquifer (Dupuit)
2/27	6: Finite Difference Transient Flow Confined and Unconfined Aquifers
3/6	7: Numerical Solution Techniques
3/13	Mid-term Project Presentations
3/20	No Class (Spring Break)
3/27	8: Flow Model Calibration and Verification
4/3	9: Advection-Dispersion-Reaction (ADR) Equation
4/10	10: Analytical Solutions (Laplace Transforms)
4/17	11: Effects of Advection, Dispersion, Sorption, and Reaction
4/24	12: Analytical versus Numerical Transport Modeling
5/1	13: Transport Model Calibration and Verification
5/8	Final Project Presentations