Department of Geological Sciences
Ohio University

GEOL 4/582
Transport Processes in Porous Media
Spring

Professor: Dr. Dina L. López
210 Clippinger Laboratories
Office Hours:

Week	Lecture	Laboratories
1	**0. Introduction to groundwater contamination problems** **1. Advective Transport** 1.1 The Eulerian approach to advective transport The particle tracking approach to advective transport	Modeling of groundwater flow and advective solute transport: introduction to program MODPATH-tutorial
2	**2. Advection and dispersive processes** 2.1 Microscopic dispersion 2.2 The dispersion coefficient and dispersive flux Macroscopic dispersion	Building a contaminant transport model: input parameters for advective transport, grid construction I
3	2.3 Advective-diffusive system 2.4 The advection-dispersion equation Examples	Building a contaminant transport model: input parameters for advective transport, grid construction and flow calibration II
4	**3. Simulation of advective transport** 3.1 Particle tracking method 3.2 Effect of spatial discretization 3.3 Capture zone delineation: steady state and transient flows	Solution of groundwater flow and advective solute transport problems: interpretation of the output 1
5	3.4 Evaluation of travel times 3.5 Breakthrough distribution Examples **1st Mid-term exam**	Solution of groundwater flow and advective solute transport problems 2: different sources

6	**4. Solute transport and chemical reactions** 4.1 Equilibrium-controlled sorption 4.1.1Sorption Isotherms 4.1.2 Sorption of organic compounds 4.1.3 Ion exchange 4.2 First-order irreversible reactions Examples	MT3D tutorial
7	**5. Simulation of dispersive-reactive solute transport** 5.1 Eulerian methods, finite element method 5.3 Lagrangian methods	Modeling of groundwater flow and reactive solute transport: creating the input
8	5.4 Mixed Eulerian-Lagrangian Methods: Method of characteristics, Modified method of characteristics	Modeling of groundwater flow and reactive solute transport: calibration
9	**6. Contaminant transport model application** 6.1 Conceptual model 6.2 Computer code selection 6.3 Calibration and sensitivity analysis 6.4 Significance of flow system 6.5 Spatial and temporal discretization 6.6 Boundary conditions 6.7 Sources and sinks 2st **Mid-term exam**	Solution of groundwater flow and reactive solute transport problems: interpretation of the output
10	**7. Input parameters and calibration** 7.1 Flow parameters 7.2 Transport parameters 7.3 Chemical parameters 7.4 Model calibration: trial and error, automated calibration. 7.5 Sensitivity analysis	
	Final Exam	

Course Administration

Homework will be assigned every week or two and must be turned in on time. Computer modeling exercises will be assigned every week during the laboratory session and must be finished during the week. The lab report must be turned in before the next laboratory session.

Two mid-quarter and one final exam will be given. 60% of the final exam will cover the last 2 weeks of classes and 40% will cover the first eight weeks. The mid-quarter and the final exams will include questions about the laboratory exercises.

Graduate students will be assigned an additional term paper. The topic for the paper will be a modeling problem assigned by the instructor. For the grading of homeworks and tests, graduate students will be required a higher level of understanding and problem solution's skills.

Grading:

Mid-quarter exam I	15%
Mid-quarter exam II	15%
Final exam	20%
Laboratory exercises and homework	50%
Total1	100%

For undergraduate students, the final grade will be given by Total1. For graduate students, the previous activities (Total1) will be 80% of the final grade and the term paper will be 20%. Letter grades will be assigned at the end of the quarter according to the statistical distribution of total points.

Student Regulations

Refer to the Undergraduate and Graduate Catalogs for regulations regarding absences from class and academic dishonesty.

Textbook

Chunmiao, Z. and Bennett, G.D., 2002. Applied Contaminant Transport Modeling, Wiley-Interscience

Class notes, handouts, and papers throughout the quarter.