

SYLLABUS

1. **Number and Name:** 16:375:509 – **GROUNDWATER POLLUTION**

2. **Credits and contact hours:** 3 credits, 2-80 minute lecture periods per week

3. **Instructor:** Christopher G. Uchrin

4. **Required Text:** C.W. Fetter, *Contaminant Hydrogeology*, Prentice Hall, 2008.

Reference Text: Freeze & Cherry, *Groundwater*, Prentice Hall, 1979

5. **Specific Course Information:**

a. **Catalog Description:** *Principles of groundwater hydrology and pollution. Development of mathematical formulations for describing pollutant movement in groundwater systems. Examination of control measures. Discussion of case studies.*

b. **Prerequisites:** Permission of instructor

c. **Course Type:** Elective

6. **Course Goals**

a. **Specific Instructional Outcomes (Course Objectives):** Students will be versed in the principles of ground water hydrology and pollution. Student problem solving skills will be enhanced through the use of homework projects and an engineering project involving considerable analytical and numerical skills.

b. Specific Student Outcomes (Learning Goals) addressed by the course include:

c. Ability to design a system, component or process to meet desired needs

Instructional Activity: Successful completion of project focused on a ground water pollution application

Assessment Activity: Individual grading of student projects focused on the formulation of a mathematical modeling system to analyze a complex ground water pollution problem

e. Ability to identify, formulate and solve environmental engineering/science problems

Instructional Activity: Successful completion of project focused on a ground water pollution application

Assessment Activity: Individual grading of student projects focused on:

1. Theoretical development and application
2. Technical accuracy

3. Conclusions
4. Written presentation

k. Ability to use techniques, skills and modern engineering tools necessary for environmental engineering/science practice

Instructional Activity: Successful completion of project and homework assignments incorporating advanced mathematical (computer) modeling techniques focused on ground water quality

Assessment Activity: Individual grading of student projects and homework assignments focused on using advanced engineering tools specifically for technical accuracy and visuals

7. Schedule/Topics

<u>Lecture</u>	<u>Topic</u>
1-3	Introduction; Hydrologic cycle; Global water budget – Simple systems modeling; Composite hydrologic systems; Conceptual hydrogeologic models; Evaporation, transpiration, and runoff
4	Fundamentals of groundwater pollution
5-8	Groundwater hydraulics; Fluid statics; Piezometers; Principles of mass and energy conservation; Continuity equation; Bernoulli's equation
9-10	Fundamentals of groundwater hydrology; Classification of subsurface water; Aquifers; Aquifer parameters; Groundwater movement
11-12	Fundamentals of mathematical models; Types of models; Batch systems; Flow systems; Dispersion; Multi-dimensional systems; Finite difference solution techniques
	<i>Exam 1</i>
13	Groundwater chemistry
14-17	Mathematics of groundwater hydrology; Pore velocity; Darcy's Law; Groundwater diffusion equation; 2-dimensional movement; Wells; Dupuit's assumptions; Applications
18-23	Pollutant transport through porous media; Adsorption/desorption; Isotherms and equilibrium conditions; Hysteresis; Microbial transformations; Multi-dimensional systems

Exam 2

24-26 Unsaturated systems

Grading:	Homework	25%
	Exam 1	20%
	Exam 2	20%
	Project	35%

Prepared by: Christopher Uchirin 01/16/2013