

GROUNDWATER FLOW MODELING

Instructor: H.M. Haitjema, haitjema@indiana.edu

Fall 2008

Time & location: **TR 11:15 am. – 12:30 pm. in BH308**

Course number: **E554 sect.#: 13348**

Office hours: **TR 10:00–11:00 am. SPEA 439.**

Secretary: **Genia Marvin 855-0563 euasher@indiana.edu**

Teaching Assistant: **Daniel Abrams, dbabrams@indiana.edu**
office hours: TBA room 416/426.

Class text: **‘Analytic Element Modeling of Groundwater Flow’, H. M. Haitjema, 1995, ClassPak - IU bookstore.**

Recommended Reading:

(1) ‘Applied Groundwater Modeling. Simulation of Flow and Advective Transport’, Mary P. Anderson and William W. Woessner, 1992, Academic Press, Inc., San Diego

(2) ‘A Civil Action’, Jonathan Harr, Vintage Books, 1995

Course Description

The student is introduced to the fundamentals of groundwater flow modeling, which are demonstrated through exercises in one-dimensional and radial flow. Two-dimensional flow is treated by use of a semi-analytic approach and is applied to simple cases of regional flow. Streamline tracing is discussed to study the spreading of contaminants. As part of the course the student will perform a computer modeling exercise using the analytic element model GFLOW. During the second part of the course more complex modeling issues are being discussed, including the modeling of 3D and transient flow. The student is also introduced to alternative modeling techniques, such as finite elements and finite differences, particularly the use of the popular USGS MODFLOW model.

Course Objectives

To familiarize the student with the basics of groundwater flow modeling. The student will be trained to solve elementary groundwater flow problems and is instructed how to address more complicated problems. The emphasis of the course is on independent problem solving, rather than on the use of “canned” programs.

Course Grading

<i>Midterm</i>	(25%)	October 16 - take home, due: October 23 (in class).
<i>Modeling exercise</i>	(30%)	October 23 - hand out, due: December 4 (in class)
<i>Final exam</i>	(25%)	Thursday December 18 - final exam (in class) 5:00 - 7:00 p.m.
<i>Homework</i>	(20%)	handed out weekly, due after one (1) week.

COURSE OUTLINE E554

week	subject	section
1	Basic concepts	chapter 2
2	1D flow, discharge potentials, flow nets	3.0 - 3.1.7
3	Superposition, method of images	3.1.8 - 3.1.16
4	1D flow with recharge	3.1.17 - 3.2.2
5	Radial flow with recharge, streamlines, travel times	3.2.3 - 3.2.8
6	Flow in multiple aquifers	3.3 - 3.3.3
7	Heterogeneous aquifers, review, Midterm handout	3.4 - 3.4.6
8	Analytic element method, Midterm due , Handout modeling project	3.5 - 3.5.3
9	Basic modeling concepts	5.3 - 5.3.6
10	Multi-aquifer wells, project milestone 1 due	3.3.4 - 3.3.5
11	Approximate vertical flow, project milestone 2 due	3.5 - 3.5.3
12	Transient flow	3.6 - 3.6.4
13	Finite Difference Method,	handout
14	Using MODFLOW, modeling project due	handout
15	Presentations of projects	...
16	Final exam	...