



Hydrogeology

The University of Toledo
Department of Environmental Sciences
EEES-4410/5410, (CRN-10189)

Instructor:	James Martin-Hayden	Term:	Spring 2015
Email:	James.Martin-Hayden@UToledo.edu	Class Location:	BO-1006
Office Hours:	M-Th, 11:00am-12:15pm	Class Day/Time:	MW 12:30-1:45pm
Office Location:	BO-3051A (in back of lab BO-3051)	Credit Hours:	3
Office Phone:	419-206-0368 (use email if no answer)		

COURSE/CATALOG DESCRIPTION

This course covers the fundamentals of groundwater flow and geological controls including applications to water resource evaluation, utilization, chemical characterization and contaminant transport. Basic groundwater course for environmental scientists, geologists and engineers.

COURSE OVERVIEW

Hydrogeology introduces the fundamentals of groundwater/earth interactions concentrating on the physical aspects of groundwater flow with applications to the field of water resources and contaminant investigations. This course is designed as the fundamental course in groundwater for students who plan to use hydrogeology in their careers, e.g., environmental geologists, civil and environmental engineers, environmental specialists and scientists, and petroleum geologists.

STUDENT LEARNING OUTCOMES

Upon completing this course, the student will be able to:

- 1. Map groundwater local and regional flow regimes,*
- 2. Calculate aquifer and aquitard flow and storage parameters given hydraulic test data,*
- 3. Evaluate groundwater resource availability and quality,*
- 4. Construct and analyze storm and seasonal hydrographs data to determine baseflow rates,*
- 5. Perform drainage basin water balance analysis,*
- 6. Calculate groundwater flow rates, fluxes and storage during ambient and stressed conditions*

Hydrogeology students must demonstrate the capacity to apply mathematical reasoning and scientific inquiry to hydrogeological problems (i.e., demonstrate scientific and quantitative reasoning.)

TEACHING STRATEGIES

Hydrogeology is presented face-to-face with time allotted for students to work on problems and ask questions. Much of the field of hydrogeology applies quantitative analyses to address groundwater problems using the sets of data and analyses presented during the lectures.

PREREQUISITES AND COREQUISITES

Prerequisite: MATH 1750 or 1850, or 1830 or 1920.



REQUIRED TEXTS AND ANCILLARY MATERIALS

Applied Hydrogeology, 4th ed., C.W. Fetter, Macmillan College Pub. Inc., New York, NY, 2001.
ISBN 0-13-088239-9

Recommended Reading:

A Civil Action, 1995, J. Harr, Random House. (Now a major motion picture starring John Travolta!... Really.)

TECHNOLOGY REQUIREMENTS

Hydrogeology requires access to a personal computer to complete assignments. The software used includes Microsoft Excel or any suitable spreadsheet program that allows the analysis and graphing of tabulated data. Access to Blackboard is required to obtain homework assignments, lecture outlines, data set and maps.

UNIVERSITY POLICIES

Policy Statement on Non-Discrimination on the basis of Disability (ADA.) The University is an equal opportunity educational institution. Please read [The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance](#).

Academic Accommodations

The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the [Student Disability Services Office](#).

GRADING

Two in-class exams are each worth 20% of the final grade and the final exam is worth 30%. Homework/quizzes will constitute 30% of your final grade (Graduates: 15%, Project 15%).

Exams: The course will be presented in three units, 1) Fundamentals of hydrogeology; 2) Regional Groundwater Flow and Geology; and 3) Water resource evaluation (hydrologic and chemical). Each of these units will be followed by an exam. Because application of principles is cumulative, the final exam will be comprehensive.

Homework: Generally readings and worked problems assigned weekly and due the following week.

Quizzes: Two or three a month, will focus on either the readings or the worked problems.

Graduates: A project to be completed before the end of the semester constitutes half of the homework and quiz grade.

Midterm Grading: *Homeworks completed by midterm and Exam 1 constitute the midterm grade.*

Final Grading: *Conventional letter+/- scale, i.e., A >95%, A- 90-94%, B+ 87-89%, B 84-86%, ..., F <60%*

COURSE SCHEDULE

<u>Week</u>		Unit 1: Fundamentals of hydrogeology.
1/12	1	Introduction to groundwater and hydrogeology
1/19	2	The water cycle and Surface-water/ground-water interactions
1/26	3	Properties of fluids, water, and porous media, aquifers
2/2	4	Principles of groundwater flow (Darcy's law)
2/9	5	Principles of groundwater flow, continued.



Unit 2: Groundwater Flow and Geology.

2/16	6	Regional groundwater flow and flow regimes,
2/23	7	Exam 1 on Unit 1, Wed., Feb. 25 th
3/2	8	Geology and groundwater flow
3/9	9	Spring Break

Unit 3: Water Resource Evaluation

3/16	10	Geology and groundwater flow (cont.)
3/23	11	Steady state groundwater flow and wells,
3/30	12	Exam 2 on Unit 2, Wed., April 1
4/6	13	Transient groundwater flow to wells
4/13	14	Groundwater chemistry and presentation of hydrogeochemical data
4/20	15	Groundwater contamination
4/27	16	Tie up and review
5/4	Finals Week, Final Exam: Mon., May 4 th , 12:30-2:30pm	