GEOL3140 Hydrogeology

Professor: Dr. James Heiss
Office: Olney Hall 102C
Email: james_heiss@uml.edu
Class meetings: MWF 12:00-12:50pm
Mailbox: Olney 201A
Office hours: I will be available to answer questions *during scheduled office hours*:
M 1:00-2:00pm, F 9:30-10:30am, or my appointment

Overview
The objective of this course is to provide the fundamentals of the role of groundwater in the water cycle. Topics include: water balance equation, aquifers, porosity, hydraulic, conductivity, hydraulic head, Darcy's law, flow nets and continuity, groundwater flow patterns, groundwater-surface water interactions, transient systems and storage, pump test analysis, groundwater flow equation, numerical modeling of groundwater flow, solute transport, unsaturated flow, coastal hydrogeology, groundwater biogeochemistry. Students will be provided with the critical knowledge base needed to work in the field of groundwater hydrology and enroll in advanced groundwater courses.

Email
Any email that you send to me *must* have "ENVI3140 S19" at the beginning of the subject line. Any email that you receive from me will have ENVI3140 S19 in the subject line.

Textbook
A textbook is not required but will be very helpful when completing problem sets, studying, and having a resource in the future. The two de facto texts are:

- *Applied Hydrogeology*, by C.W. Fetter, Prentice Hall, Inc., Fourth Edition, 2001 (industry standard)
- *Groundwater*, by R.A. Freeze and J.A. Cherry, Prentice Hall, Inc, 1979 (Prior to Fetter, this was the go-to book. It is still super relevant and it is now free! http://hydrogeologistswithoutborders.org/wordpress/1979-english/

Learning outcomes

- Understand the distribution and movement of water through components of the hydrological cycle on various scales
- Understand the various hydrogeologic properties of aquifers
- interpret measurements of hydraulic head and generate water table maps and hydrogeologic cross-sections
- Use the principles of groundwater flow, including Darcy's Law, to solve groundwater flow problems
- Measure aquifer properties through well testing
- Measure/acquire and analyze hydrogeological data
- Understand the basic chemical processes that control groundwater chemistry and water quality
- Understand the strengths and weaknesses associated with groundwater modeling
- Identify, formulate, and solve introductory groundwater hydrology problems

Course Requirements
Problem sets
Problem Sets are intended to demonstrate or reinforce concepts or skills learned in class or during field trips. In some cases we will go over the assignments in class on the due date. For this reason, completed

assignments are due at the beginning of the class period on the due date. In-class assignments fall under the Problem Set category. Any student not present in class who does not turn in a Problem Set on the due date without contacting me beforehand will receive 10 percentage points off the assignment grade each day it is late. Problem Sets will not be accepted by email.

Exams
This course includes two exams and one final exam. The final exam will be heavily weighted toward material in the last 1/3 of the semester, but will draw on material from the first 2/3 of the semester. Attendance is mandatory for all exams. Any discussion about missing an exam must occur prior to the exam.

Aquifer Project
This 2-3 student group project requires independent literature research on a world aquifer system, a short paper, and a short presentation, Tip: Start the project well in advance of the presentation and due date.

Expectations

- All plots and diagrams should have appropriate labels (with units) on all axes and a title or caption clearly describing what is plotted. All values should have units unless the value is unitless. All work should be shown on assignments and exams.
- Each student is responsible for completing their own work. You are encouraged to collaborate with and help one another and to use the resources available to you, including lecture material, the textbook, outside sources (internet, academic papers, other texts). *Write names of collaborators on the top of each Problem Set.* Your work should *not* be identical to work turned in by others.
- Please bring a pencil, pen, and ruler to each class.

Academic Dishonesty
Dishonesty will not be tolerated. Cheating/plagiarism will be addressed in accordance with University of Massachusetts Lowell policy.

Grading

Problem Sets	30%
Aquifer project	5%
Exam 1	17.5%
Exam 2	17.5%
Final Exam	25%
Class participation	5%
Total:	100%

*Grades are rounded to the nearest tenth.

Percentage	Letter Grade
>92	A
90 – 92	A-
88 – 89	B+
83 – 87	B
80 – 82	B-
78 - 79	C+
73 – 77	C
70 - 72	C-
68 – 69	D+
60 – 67	D
<60	F

Exam 1: March 1, 2019
Exam 2: April 12, 2019
Final Exam: TBA