GEOL 394

# Environmental Hydrogeology

Fall 2013

Instructor: Tej Gautam, Ph.D. E-mail: tpg001@marietta.edu
Office: 301D Brown, Ext- x4371; Office hours: M 1:00-3:00, T 9:00-11:00, F 10:00-11:00
Meetings: Lecture MWF 9:00-9:50; Lab F 1:00-3:00 at 304 Brown.

Required Texts: Applied Hydrogeology, C.W. Fetter, Fourth Ed., 2001. Prentice Hall.
Basic Ground-Water Hydrology, R.C. Heath, USGS (link will be provided).
Additional study materials will be provided as required.

## Course Description and Objectives

This course will cover various aspects related to hydrogeology including water budget, interactions between its components, hydrologic cycle, aquifer properties, principles and methods for computing the groundwater flow, recharge concepts, and ground water contamination and management issues.

Students will develop quantitative skills and learn methods computing groundwater flow, perform hydrogeologic investigation, and be able to understand and use the techniques that are used to solve real world problems related to groundwater occurrence, flow, and contamination issues.

## Prerequisites

SAT-M of 400+ or ACT-M of 19+ or completion of Mathematics 080 with a grade "C" or better and Geol 111 or Geol 101. Basic mathematical skills and understanding of various geological processes are expected for this class.

## Missed Class Time Due to Co-Curricular Events or Religious Observances

Classes missed due to participation in college-sponsored co-curricular events *or college-recognized religious observances* are considered excused absences provided appropriate procedures are followed. The student must notify the instructor at the earliest possible time before the absence and arrange to make up missed work as defined by the instructor's syllabus. The *co-curricular* activity must be a performance, professional meeting, or athletic contest to be considered an excused absence. *The religious observance must appear on the College's calendar of religious observances in order to be considered an excused absence. If it does not, an excused absence can be granted only if the student requests special permission from the Dean of the Faculty.*

An excused absence allows the student to make up exams or quizzes given during the absence, or to reschedule oral presentations. It is the responsibility of the student to get notes from the class and to compensate as much as possible for the absence. It is also the student's responsibility to work with the instructor in determining an appropriate time for make-up assignments. Students must recognize that many classroom and laboratory activities cannot be replicated and that absences may be detrimental to their performance.

**Homework and Lab Assignments**

You are expected to attend every class and lab. All assignments must be submitted on time and according to the instructions. Absence will not excuse you from any course requirement or deadline. You should complete and submit all homework well ahead of schedule so that computer or personal problems will not interfere with your work as assignment deadlines approach. Late submissions will be penalized.

Labs will meet every Friday at 1:00-3:00 pm, 304 Brown and it is an important part of this course. Lab assignments are due before the next lab period unless mentioned otherwise. There will be no make up for missing a lab without prior notice and a documented valid reason. There will be one field trip to local hydrogeological site to address groundwater flow and contaminations problems.

**Grading Scheme**

| | |
|---|---|
| Homework assignments | 10% |
| Lab assignments and class quizzes | 20% |
| Project work | 5% |
| Test I | 20% |
| Test II | 20% |
| Final (Comprehensive) | 25% |

A>93,A->90,B+>88,B>83,>B-80,>C+>78,>C>73,>C->70,D+>68,D>63,D->60

The schedule and grading breakdown are tentative and may be subject to change due to unforeseeable circumstances. Any changes will be announced in class and/or the syllabus will be updated on Moodle.

**Academic Dishonesty**

Dishonesty within the academic community is a very serious matter, because dishonesty destroys the basic trust necessary for a healthy educational environment. Academic dishonesty is any treatment or representation of work as if one were fully responsible for it, when it is in fact the work of another person. Academic dishonesty includes cheating, plagiarism, theft, or improper manipulation of laboratory or research data or theft of services. A substantiated case of academic dishonesty may result in disciplinary action, including a failing grade on the project, a failing grade in the course, or expulsion from the College. (*Marietta College Undergraduate Programs, 2013-2014 Catalog, p.130.*)

**Electronic Devices Policy**

The use of electronic devices is not permitted during exams. This includes cell phones, spell checkers, personal digital assistants or any other electronic device. Refrain to use them in the classes. Students who require use of any devices because of their disability should contact the instructor early in the semester.

**Documented Disabilities**

Students who believe that they may need accommodations due to a documented disability should contact the Academic Resource Center (Andrews Hall, Third floor, 376-4700) and the instructor as soon as possible to ensure that such accommodations are implemented in a timely manner. You must meet with the ARC staff to verify your eligibility for any accommodation and for academic assistance.

**Health and Wellness**

A recent American College Health Survey found stress, sleep problems, anxiety, depression, interpersonal concerns, death of a significant other and alcohol use among the top ten health impediments to academic performance. Students experiencing personal problems or situational crises during the semester are encouraged to contact the Dr. J. Michael Harding Center for Health and Wellness (740-376-4477) for assistance, support and advocacy. This service is free and confidential.

**Academic Warning Program**

Marietta College is committed to student success and engagement. Because academic success is directly linked to active engagement in class, faculty are encouraged to communicate absences, below average performance, and disengagement in order to provide support to all students. All departments participate in the Academic Update Program through MAP-Works with the Academic Resource Center.

**Course Contents***

| Week | Topics | Ch. |
|---|---|---|
| Aug. 26 | Introduction to hydrology and hydrogeology; hydrologic cycle, hydrologic equation, sources of hydrogeological information. | 1 |
| Sept. 2, 9 | Elements of the hydrologic cycle, concepts and use of stream hydrographs, determining ground water recharge from base flow | 2 |
| Sept. 16, 23 | Aquifers properties- porosity of earth materials, specific yield; Darcy's experiment and determination of hydraulic conductivity of earth materials | 3 |
| Sept. 30, Oct. 7, 14 | *Test 1*<br>Ground water flow- hydraulic head and steady flow in a confined aquifer, steady flow in an unconfined aquifer; assumptions of ground water flow to wells, computing drawdown caused by a pumping well, nonequilibrium flow and computing methods | 4,5 |
| Oct. 21 | Issues with ground water occurrence in different climatic and geographic regions | 8 |
| Oct. 28 | *Test 2*<br>Porosity and water content of soil, pore-water tension in the vadose zone and soil water<br>*Field Trip* | 6 |
| Nov. 4, 11 | Introduction to water chemistry, isotope hydrology, and representation of chemical analysis of water | 9 |
| Nov. 18 | Ground water contamination and movement of solutes in the ground water | 10 |
| Nov. 25, Dec. 2 | Hydrologic site evaluations, uses of models, and project reports | 13 |
| Dec. 9 | ***Final Exam 12:00 Noon* | |

*Course schedule/content is tentative and instructor may change as required.

**Changes related to final exam must be authorized by the Provost.