

CVEN 463 – “ENGINEERING HYDROLOGY”
FALL SEMESTER 2009

TEXAS A&M UNIVERSITY, DEPARTMENT OF CIVIL ENGINEERING

Instructor:

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Office Hours: Tues 11-12, Thurs 3-4

Lectures: Mon/Wed/Fri 12:40 – 1:30 PM; Room 219, Civil Engineering Bldg.

Text (Optional): Maidment, D.R. (ed.), *Handbook of Hydrology*, McGraw-Hill, New York, 1993. ISBN: 0-07-039732-5. The text has been placed on reserve in the library. It is optional for you to purchase. I will occasionally reference material in the text for your benefit, but you will not be required to read these sections, work problems therein, etc. This is a standard reference in professional practice, and you should consider purchasing it at some point.

Course Description: *From the TAMU Undergraduate Catalog:* “Occurrence, distribution, and properties of natural waters of the earth; measurement and engineering analysis of hydrologic phenomena including precipitation, streamflow and groundwater; hydrologic design of water resources development and management projects. Prerequisite: CVEN 339.”

Welcome to Hydrology! This course will focus on the physical processes of water moving around on the earth’s surface and in the atmosphere. We’ll learn about these processes with an obvious interest in engineering problems: water supply, flooding, environmental protection, etc. This course is always one of my favorites to teach since it involves so many things that happen all around us each day that we may not have considered seriously before. I’ve also called upon the Aggie Network and gotten some great help with data and information on current problems in Engineering Hydrology here in Texas. It should be a “great adventure” for all of us to go at these real-world problems as we learn more about the subject.

Course Objectives: After completing this course students should be able to...

- (1) Fully describe the hydrologic cycle including its component parts, appropriately quantify storage and fluxes of water in the cycle, know where to obtain various types of hydrologic data, and solve water balance problems;
- (2) Describe and map global scale circulations of water and energy in the atmosphere and oceans, and explain the physical processes driving these circulations;
- (3) Describe physical mechanisms of precipitation;
- (4) Perform basic spatial and statistical frequency analysis on precipitation and other point measured data;
- (5) Analyze quantitatively the processes of evaporation, evapotranspiration, infiltration, interception, and depression storage, and use these analyses to predict surface runoff given a storm hyetograph;
- (6) Derive unit hydrographs for gaged watersheds given appropriate rainfall-runoff data, and apply unit hydrographs for flood forecasting;
- (7) Use multiple synthetic hydrography methods for runoff and streamflow analysis with basic understanding of strengths and weaknesses of each method;

- (8) Route hydrographs through river reaches and reservoirs using hydrologic techniques;
- (9) Use HEC-HMS, HEC-GeoHMS, and ESRI GIS software to model surface hydrologic events;
- (10) Solve problems of groundwater flow for a variety of aquifer conditions including confined, unconfined, homogeneous, heterogeneous, isotropic, anisotropic, etc.;
- (11) Solve basic problems of contaminant transport in groundwater involving advection, diffusion, and dispersion;
- (12) Know the academic and professional steps available to pursue a career in hydrology and water resources engineering after completion of this course.

<u>Grading:</u>	Class Participation	8%
	Homework	17%
	Exam 1	22%
	Exam 2	23%
	Term Project	30%

Class participation credit can be earned in one of two ways. First, in lectures I will occasionally give a short (~5 min.) problem for students to solve given a few minutes to do so. Participation points can be earned by volunteering to come to the board and work the problem. Second, I will occasionally end lectures with a short discussion question (a.k.a. the “Question for Next Lecture” or “QFNL”). Before the next class, think about the question, do a little research on the web or at the library, and discuss it with classmates. Points can be earned by discussing your findings at the beginning of the next class.

There will be several Homework assignments throughout the semester. Homework assignments will be graded in two parts. About 80% (e.g., 8 out of 10 problems) of each assignment will be graded based on effort alone; you will receive full credit for simply making a reasonable attempt to solve the problem whether or not your answer is correct. You are free to work with others on those problems. The remainder of each assignment will be graded for accuracy of the solution. You *must* work these problems *individually*. Homework is due at the end of lecture on the announced date. Late homework will be penalized 25 points per day and will not be accepted once solutions have been posted on the class web site.

Exams will be traditional written exams completed individually. A variety of formats including closed and open book, etc., may be used. Exact format of exams will be announced ahead of time. Absence from exams will be dealt with according to TAMU Student Rules (see <http://student-rules.tamu.edu/rules7.htm>); please see my note later in the syllabus regarding medical absences.

The project will be done in groups of probably 4 students. I will provide a set of locations and datasets from which you may choose one to work on. The project will require you to bring together all the techniques and knowledge on surface hydrology that you have learned up to that point as well as give you experience in using the various software tools. Each group will prepare both written reports and oral presentations of the project results.

Course Website: It’s a good idea to check the course website at least daily for announcements. The website will also be the means by which homework assignments, solutions, most handouts, etc., will be distributed. http://ceprofs.tamu.edu/kbrumbelow/CVEN463/CVEN463_EH_Brumbelow.htm

Semester Schedule: Below is the tentative schedule for the course this semester. Modifications to this schedule may be announced in class at any time. Do *not* plan major life events (e.g., travel, childbirth, religious conversion, etc.) around this schedule before consulting with Dr. Brumbelow. Optional readings from the *Handbook of Hydrology* are given for your benefit.

Week	Dates	Topic and Readings
1	Aug 31 to Sep 4	Course introduction; Hydrologic cycle <i>Chapter 1</i> Watersheds; Water balance
2	Sep 7 to Sep 11	Global circulation; Precipitation mechanisms and thermodynamics <i>Chapter 2, 3.1-3.5</i>
3	Sep 14 to Sep 18	Precipitation measurement, spatial analysis, frequency analysis <i>Chapter 3.7-3.11</i> Evaporation <i>Chapter 4 (skim)</i>
4	Sep 21 to Sep 25	Precipitation losses <i>Chapter 5</i>
5	Sep 28 to Oct 2	Runoff modeling methods <i>Chapter 9.1-9.4</i>
6	Oct 5 to Oct 9	Streamflow; Hydrographs; Unit hydrographs; Synthetic hydrography <i>Chapter 8, 9.5-8</i>
7	Oct 12 - Oct 14 Oct 16	Routing <i>Chapter 10</i> Exam 1 (tentative date, subject to change)
8	Oct 19 to Oct 23	Routing (cont.) Watershed modeling; HEC-HMS Project Assignment
9	Oct 26 to Oct 30	Watershed modeling (cont.)
10	Nov 2 to Nov 6	GIS and Hydrology
11	Nov 9 to Nov 13	GIS and Hydrology (cont.)
12	Nov 16 Nov 18 - 20	Midterm Exam 2 (tentative date) Advanced Hydrologic Modeling
12.5	Nov 23 - 25 Nov 27	Advanced Hydrologic Modeling (cont.) <i>Thanksgiving Holiday – No Class</i>
13.5	Nov 30 to Dec 4	Advanced Hydrologic Modeling (cont.)
14	Dec 7	Advanced Hydrologic Modeling (cont.)
Term Project Presentations		Monday, Dec 14, 10:30 AM – 12:30 PM

Absences: TAMU policies regarding student attendance/absences are defined in Part I, Section 7 of the TAMU Student Rules. In addition to those rules, the following policies will apply in this course:

- I do not check attendance as a part of regular course grading – no one will be penalized just for missing class. However, I reserve complete discretion to award bonus points for attendance. Absence or tardiness (even with an excuse) will disqualify a student for such bonus points. My decision on any such bonus points is final. Please do not argue with me over these points.
- I do not require an excuse for an absence on a day when no graded assignment was due or exam was given.
- To excuse an absence that falls under rule 7.1.6 (Injury or Illness that is too severe or contagious for the student to attend class), I will require a medical confirmation note completed by a healthcare provider with a contact phone number no matter how long the student is out of class.
- If a student knows ahead of time that they will be absent from class on a homework due date, they are allowed to have another person submit their assignment on the due date. This is encouraged but not required.
- Since class participation credit may be earned on any class day, failure to earn this credit will not be excused by any absence.

Student Rules: TAMU Student Rules are posted at <http://student-rules.tamu.edu>. You should be familiar with these by now. Any issue not addressed explicitly in this syllabus will be governed by the Student Rules.

Official Notices

ADA Statement: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Cain Hall or call 845-1637.

Academic Integrity Statement: “An Aggie does not lie, cheat, or steal or tolerate those who do.” Students are expected to understand and abide by the Aggie Honor Code presented on the web at: <http://www.tamu.edu/aggiehonor>. No form of scholastic misconduct will be tolerated. Academic misconduct includes cheating, fabrication, falsification, multiple submissions, plagiarism, complicity, etc. These are more fully defined in the above web site. Violations will be handled in accordance with the Aggie Honor System Process described on the web site.

The handouts used in this course are copyrighted. By “handouts,” I mean all materials generated for this class, which include but are not limited to syllabi, notes, quizzes, exams, in-class materials, review sheets, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts unless I expressly grant permission.

Cheating on quizzes and exams will not be tolerated. Cheating will be reported and handled in accordance with the Aggie Honor System Process. Some or all examinations will be closed book; “looking at another student's examination or using external aids (for example, books, notes, calculators, conversation with others, or electronic devices)” during these examinations is a violation of Texas A&M Aggie Honor Code, Cheating, unless specifically allowed in advance by the instructor.

Unless specifically allowed in advance by the instructor, all assignments and homework in this class are expected to be completed based on individual effort. Copying the work of others, including homework, is a violation of Texas A&M Aggie Honor Code, Cheating.