Fresh-Water Flow: (ERS 350/ERS 588), 3 Credits

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Lecture: MWF 10:00 to 10:50 AM

Textbooks

Gupta, Ram. Hydrology and Hydraulic Systems. 3rd Ed. Waveland Press

Course Description

Fresh-Water Flow focuses on the components of the water cycle associated with precipitation, groundwater and surface-water flows. Topics covered include quantification of rainfall, interception, infiltration, runoff production, subsurface flow and surface flow. Concepts related to surface and subsurface hydraulics will be presented. Simple models used to estimate water flux will be used to demonstrate how watershed hydrologic components related to each other.

Prerequisite

Pre-Calculus (MAT 122)

Learning Outcomes

After successful completion of this course, students will be able to:

- identify the different components of the hydrologic cycle.
- use basic environmental data (eg. precipitation, temperature, slope) to calculate different water flux rates.
- use hydrologic data to make simple estimates of extreme events
- understand how humans impact the hydrologic system and attempt to regulate flows.

Learning Assessment:

Student grades will be based on the following items:

	ERS 350	ERS 588
Quizzes	40%	30%
Problem Sets	30%	20%
Final Exam	30%	25%
Project	None	25%

Quizzes will be given every other week through the semester. Quizzes will be made up of short answer and multiple choice questions based on material discussed in class over the previous two weeks. One quiz score will be dropped and the remaining scores will be averaged. The final exam will be a comprehensive and will have a format similar to the quizzes.

Short problem sets, based on selected problems from the textbook, will be assigned weekly through the semester. Students are encouraged to use a spreadsheet or similar software to manipulate the data provided in these problems. All problem sets will by type written or *neatly* hand written with sufficient structure and information, including comments, so a reviewer can *easily*

follow the solution procedure. This write-up should include a concise description of how you did the problem (equations used, steps taken, data used to make plots, etc.)

Graduate students (only) are required to complete a substantial project related to a topic of interest. Final projects will include a report with supporting materials included as appendixes (eg. data, computer codes, supporting calculations). This report will be turned in on the last day of class before 4:58PM Eastern Time. Examples of acceptable topics include:

- Using a hydrologic model to simulate a hydrologic process. Modeling platform must be approved by the instructors. Recommended modeling software include: HECRAS, HECHMS, MIKESHE, MODFLOW, TR20, and WEPP.
  - Create a 2-D model simulating groundwater flow to a stream.
  - Simulate surface flow across a small drainage basin.
  - Evaluate stream flow in a small drainage basin.
- Developing computer tool that simulates a hydrologic process or facilitates analysis of hydrologic data.
  - Develop a simple groundwater flow model using your favorite computer language.
  - Create a spreadsheet program to evaluate channel hydraulic condition, pond storage, or the capacity of a road culvert.
- Collect and analyze a significant hydrologic data set (approved by the instructors).
  - Measure snow pack and determine water content through the winter in a drainage basin.
  - Obtain surface-water discharge data and perform hydrograph separation on the data set.
  - Obtain and analyze precipitation data across the state of Maine

Classroom Policies

Late Assignments Late assignments will be penalized half a letter grade for each day they are late. No assignment will be accepted more than seven days after the due date. In addition, assignments will not be accepted after they have been graded and returned.

Attendance Students are expected to attend and participate in class and are responsible for all information presented in class.

Missed Exams/Quizzes Students unable to attend a quiz or exam must notify the instructor and make alternative arrangements **before** the exam/quiz. Only in exceptional circumstances will students be allowed to miss an exam or quiz. In these circumstances, the students average exam or quiz grade (all quizzes, no dropped grades) will be substituted for the missed exam or quiz grade.

Required Statements

Disabilities (ADA) Statement Students with disabilities who may need services or accommodations to fully participate in this class should contact Ann Smith, Director of Disability Services in 121 East Annex, (voice) 581-2319, (TTY) 581-2325 as early as possible in the semester.

Academic Integrity Academic dishonesty includes cheating, plagiarism and all forms of misrepresentation in academic work, and is unacceptable at The University of Maine.

As indicated in the University of Maine's undergraduate on-line *Student Handbook*, plagiarism (the submission of another's work without appropriate attribution) and cheating are violations of The University of Maine Student Conduct Code. An instructor who has probable cause or reason to believe a student has cheated may act upon such evidence, and should report the case to the supervising faculty member or the Department Chair for appropriate action.

Flu Outbreak In the event of disruption of normal classroom activities due to a flu outbreak or other widespread event, the format for this course may be modified to enable completion of the course. In that event, you will be provided an addendum to this syllabus that will supersede this version.

Lecture Schedule**

Week**	Topic	Reading*	Assignment
01: Jan. 14	Physical properties of water, the water cycle and systems, data analysis methods	G(2.1-2.4)	
	Flows to/from the Atmosphere		
02: Jan 21	Precipitation, *NOAA web examples, extreme precip. events*	G(2.5-2.9)	No Monday Class (MLK Day)
03: Jan 28	Evapotranspiration, *climate change implications*	G(2.9-2.12)	
	Subsurface Flows		
04: Feb 04	Infiltration Process, *Antecedent moisture assumptions, soil properties, USDA resources*		
05: Feb 11	Infiltration and Rainfall Excess, *Horton, Green-Ampt, NRCS method*	G(2.13-2.15)	
06: Feb 18	Snow Hydrology, Pressure Flow Systems, *USGS and MGS resources*	G(2.17,12.1-12.7,12.10-12.11)	
07: Feb 25	Ground-Water Flow	G(Ch. 3, 4.1,4.2)	
	Spring Break: 03/04-03/015		
	Surface Flows		
08: Mar 18	Runoff and Hydrographs , *USGS & USDA resources*	G(7.1-7.18)	
09: Mar 25	Ungaged rivers, extreme events	G(7.24,7.25,7.27,8.2,8.6-8.9,8.12)	
10: Apr 01	Hydraulics, Open Channel Flow	G(9.1-9.4,11.1-11.6)	
11: Apr 08	Hydraulic geometry, Measuring stream flow	G(7.26, 6.1-6.18)	
12: Apr 15	Stage-discharge curves	G(6.25-6.27)	
13: Apr 22	Flow Control Structures	G(10.1-10.6)	
14: Apr 29	Watershed simulation	USDA Manual, Field Exercise Wed(ME Day)	

*G indicates chapter from Gupta, ** The timing of lectures in this class may change to accommodate student questions and other unpredictable events. These times are only estimates.