GEO 425/525

Fall 2008 TuTh 8:00-9:15; Shideler 229
W. Renwick, Office: Shideler 216, 529-5010. Office hours: by appointment.
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Textbook: Ward & Trimble, Environmental Hydrology, 2nd ed.

OBJECTIVES:

This is a course in surface water hydrology for environmental management. It assumes that many of the students will enter careers in which knowledge of applied surface water hydrology is necessary for understanding and managing environmental problems. The course objectives are to:

1. Explore the basic processes governing movements of surface water, to the extent necessary to understand the utility, strengths, and weaknesses of various problem-solving methods.
2. Survey the most commonly used methods in applied surface water hydrology, and develop an understanding of how these methods are used.

In addition to its role in the Geography major, Geo 425 serves as a third course in a three-course thematic sequence entitled Earth's Physical Environment: Geographic Patterns and Processes. This sequence includes Geo 121, Introduction to Physical Geography; Geo 221, Regional Physical Environments; and a choice of one of several advanced courses that deal with specific groups of processes and environments. Geo 425 is also one of three courses that may be taken as the third course in a thematic sequence entitled The Water Planet.

As a Miami Plan thematic sequence course, GEO 425 seeks to further the goals of the Miami Plan. Specifically, an emphasis on quantitative analysis of hydrologic phenomena is intended to develop skills in critical thinking. One theme in such analyses is the distinction between empirical and physical/analytical methods for predicting hydrologic quantities, and the relative advantages and disadvantages of each. Because the course deals with all aspects of the hydrologic cycle, from precipitation to flood hydrology, it necessarily develops students understanding the environmental and contexts of water resources. Hydrology is studied from an applied perspective, considering such issues as land use change and stream flow, links between vegetation and water resources, and hydrologic constraints on human activities. Students are encouraged to work together on the five problem-solving exercises and so engage with other learners. Finally, because many of the students in this class are preparing for careers in environmental management they are inevitably reflecting and acting on materials studied in the course. Even those who will not use the content in a professional context learn observational and interpretive skills to help them understand everyday hydrologic conditions such as rainfall occurrence, runoff amounts, and soil moisture levels.

COURSE REQUIREMENTS AND EVALUATION:

Exercises

1. Estimating watershed precipitation
2. Precipitation and runoff data
3. Potential evapotranspiration
4. Sediment transport analysis
5. Stream channel classification
6. Flood frequency analysis
7. Literature review (Graduate students only).

Students are encouraged to work together on exercises if they so choose. Because most of the work will be done on computers it often happens that a group of students working together will hand in work that virtually identical work. However, each student must hand in his/her own copy of the work, and each student is individually responsible for its quality, and for understanding the details of the work. If your work includes errors that reflect carelessness such as simple arithmetic errors one I will assume that only one of those involved actually did the work, for if a second person had been involved he/she would have caught the error. Grades in such cases will be discounted appropriately.

In addition to the six exercises, graduate students will be expected to prepare a brief review of recent literature on a pertinent topic of the student's choice. The written review should contain at least 25 citations of articles from the past 5-10 years, and be a maximum of 2500 words in length excluding bibliography and illustrations. Students will also present a brief (10-minute max.) oral summary of their review to the class. Topics for the literature review must be chosen by Oct. 16.

Exams:

The midterm exam is objective in content, while the final exam has both objective and interpretive questions.

Evaluation:

Evaluation for students in Geo 425 will be based on the following:

Midterm exam	100 points
Final exam	100 points
6 exercises @ 20 points each	120 points
Total	320 points

Evaluation for students in Geo 525 will be based on the above 320 points plus 50 points for the literature review.

Grades will be assigned using a curve based on distribution of point totals.

SCHEDULE OF CLASSES:

Date	Topic	Readings (textbook pages)
26-Aug	Introduction; The global hydrologic context (Ex. 7)	1-26
28-Aug	The hydrologic cycle and water budgets	29-26
2-Sep	Precipitation processes	29-36
4-Sep	Precipitation measurement	36-45
9-Sep	GIS in hydrology	
11-Sep	Drainage basins (Ex. 1)	
16-Sep	Event frequency and probability (Ex. 2)	45-48
18-Sep	Area-duration relations	48-50
23-Sep	Interception	86, 295-297 (Ex. 1 due)
25-Sep	Water in the soil	55-62, 73-80
30-Sep	Infiltration	62-73 (Ex. 2 due)
2-Oct	Evaporation measurement and processes	83-100
7-Oct	Transpiration	297-298
9-Oct	Potential evapotranspiration (Ex. 3)	100-113
14-Oct	Water budgets, revisited	113-117
16-Oct	MIDTERM EXAM	(Ex. 7 topics due)
21-Oct	Runoff processes	119-132, 301-308
23-Oct	Runoff prediction	132-152 (Ex. 3 due)
28-Oct	River channels and open channel flow	161-177, 207-222
30-Oct	River channels and open channel flow	183-194
4-Nov	Channel modification and reservoirs	227-252
6-Nov	Sediment transport (Ex. 4)	177-183
11-Nov	Soil erosion and conservation	255-271
13-Nov	Stream bank erosion (Ex. 5)	194-204
18-Nov	Channel change	272-289
20-Nov	Flood frequency analysis for gaged rivers (Ex. 6)	345-349 (Ex. 4 due)
25-Nov	Land use and watershed management	349-368
2-Dec	Watershed modeling	
4-Dec	Presentations	(Ex. 5 due)
9-Dec	Presentations	
11-Dec	Wrap-up/review	(Exs. 6 and 7 due)
15-Dec	FINAL EXAM, 9:45 am	