Geog 415 Hydrogeography Spring 2011

Time and location

MW 15:30-16:45 in Bolton B83

Instructor

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Course content

This course provides an introduction to hydrological science, with a focus on the interaction of water with the physical and human systems at various geographical and temporal scales. The course will cover topics ranging from precipitation, evapotranspiration, infiltration, runoff, water quality, hydrological data, geographical and temporal analysis of hydrological information, and hydrological modeling. The course will address both theoretical and applied aspects of hydrological science with a mixture of both descriptive and quantitative methods. The course will be mostly in the form of lecture and complemented by reading, discussion and computer labs.

Learning outcome

Students are expected to obtain descriptive and quantitative knowledge of introductory hydrology in context of human-nature interaction at the end of the course. In other words, students are expected to understand (1) how water is related with other Earth systems (e.g., atmosphere, lithosphere, and biosphere); (2) how water is related with the human activity (e.g., land use); and (3) how to collect, analyze, and model hydrological information at various geographical and temporal scales.

Prerequisite

Geog 120 AND Geog 215; or graduate standing

Course materials

Required textbook: *Fundamentals of Hydrology* 2nd edition (2008) by T. Davie, Routledge, ISBN: 978-0-415-39987-6. It is available at People's Books Cooperative (414-962-0575), located at the corner of Locust and Maryland, next to the coffee shop.

Supplementary material:

- Selected chapters from *Hydroclimatology: Perspectives and Applications* (2009) by M.L.

Shelton, Cambridge University Press
- Selected chapters from *Arc Hydro: GIS for Water Resources* (2002) by D. Maidment, ESRI Press
- GIS and modeling software installed on the classroom PC
- Articles for reading presentations

Requirements

- Exams: three exams will be given during the semester. They are not cumulative. A review session will be offered before each exam.
- Assignments: four assignments will be given to provide students with opportunities to apply concepts and practice skills.
- Reading presentation: **graduate students** will have to read three articles and present in class for discussion. One should give presentations in separate weeks.
- Article discussion: **Undergraduate students** will have to write a discussion of an article of their choice presented by a graduate student. Each written discussion is due within two weeks from the article's presentation. Up to two students can discuss the same article. You have to sign up to the article group on a first-come first-served basis. There is an example of a written discussion to an article on D2L-Content.
- Term paper: **graduate students** will have to write a term paper either of extensive literature review or a research project. There is an example of a literature review paper on D2L-Content. A term paper consists of a proposal, a preliminary report, a presentation, and a final paper, each of which has a different deadline and is graded separately. Each graduate student must make an appointment with the UWM Writing Center after submitting a proposal and before submitting a final paper to discuss his/her term paper.

Evaluation

Final grades will be made based on the accumulated total points throughout the course.

	U	G	Grading scale
Exams	180	210	A: 91-100%, A-: 87-90%,
Assignments	200	200	B+: 83-86%, B: 80-82%,
Reading Presentation	(10)	90	B-: 77-79%, C+: 73-76%,
Article discussion	20	N/A	C: 70-72%, C-: 67-69%,
Term paper	(40)	100 (proposal: 10, preliminary report: 20, presentation: 20, paper: 50)	D+: 64-66%, D: 62-63%, D-: 60-61%, F: 0-59%
TOTAL	**400**	**600**	

Other course policy

- Academic Integrity: Plagiarism will not be tolerated in this class and students involved will receive a **zero** grade. Severer cases will be submitted to the University for further scrutiny. The scope and disciplines of student academic misconducts are specified in Chapter UWS 14 and UWM implementation provisions (Faculty Document 1686) and http://www4.uwm.edu/secu/SyllabusLinks.pdf. UWM Disciplinary Guidelines can be found in the Office of the Dean of Students, Mellencamp Hall, Rm118.

- Class Etiquette: I expect that you will conduct yourself in class in the same manner that you yourself would like to be treated. Class disruptions will not be tolerated as it erodes the educational environment for everyone.
- Finality of Grade: All grades, once released on D2L or PAWS, are final except in cases of clerical error.
- Special Accommodation: Any student who feels he or she may need an accommodation based on the impact of disability, religion, or other civic duty should contact Instructor privately as early as possible to discuss his or her specific needs. A student should notify Instructor, within the first three weeks of the beginning of class, of the specific days or dates on which he or she will request relief from an examination or academic requirement for a religious observance. The student notification will be kept confidential.
- Other Notice:
  - Make-ups will be allowed at the discretion of Instructor when a pre-approval has been obtained or in case of emergency with written proof
  - Other unspecified matters will be handled according to the University policies listed on http://www4.uwm.edu/secu/SyllabusLinks.pdf
  - If you are having any trouble in class, please see Instructor as soon as possible

Schedule

Week	Date	Class content	Chapter	Assignment
1	24-Jan	Course introduction	D1	
	26-Jan	Precipitation	D2	
2	31-Jan	Precipitation	D2	
	2-Feb	Evaporation	D3	
3	7-Feb	Storage	D4	
	9-Feb	Runoff	D5	#1 handed out
4	14-Feb	Runoff	D5	
	16-Feb	Spatial variations of water	S7	#1 due
5	21-Feb	Spatial variations of water	S7	
	23-Feb	Review for exam		
6	28-Feb	**EXAM 1**		
	2-Mar	Temporal variations of water	S8	
7	7-Mar	Temporal variations of water	S8	
	9-Mar	Human activity and hydrogeography	D7	#2 handed out
8	14-Mar	Human activity and hydrogeography	D7	
	16-Mar	Flood	S9	#2 due
9	21-Mar	(Spring break)		
	23-Mar	(Spring break)		
10	28-Mar	Flood		
		Term paper proposal due	S9	#3 handed out
	30-Mar	Drought	S10	
11	4-Apr	Data collection and analysis	D6	#3 due
	6-Apr	Review for exam		
12	11-Apr	**EXAM 2**		
	13-Apr	Field trip		
13	18-Apr	Data collection and analysis	M7	
	20-Apr	Hydrological modelling	M8	

14	25-Apr	Hydrological modelling		
		Term paper preliminary report due	M8	
	27-Apr	Spatial analysis using GIS	M8	#4 handed out
15	2-May	Spatial analysis using GIS	M8	
	4-May	Term paper presentation		#4 due
16	9-May	Term paper presentation		
	11-May	Review for exam		
	18-May	**TERM PAPER DUE (noon)**		
		EXAM 3 (15:00-17:00)		

D: Tim Davie "Fundamentals of Hydrology"
M: David Maidment "Arc Hydro"
S: M.L. Shelton "Hydroclimatology"

Reading list for graduate students

*Available at the Library Reserve (http://www4.uwm.edu/libraries/ereserve/choi/GEOG415.html)

Week 2

1. Lettenmaier, D. P. & J. S. Famiglietti (2006) Hydrology - Water from on high. *Nature,* 444**,** 562-563.
2. Clifford, N. J. (2002) Hydrology: the changing paradigm. *Progress in Physical Geography,* 26**,** 290-301.

Week 3

3. Rotstayn, L. D., M. L. Roderick & G. D. Farquhar (2006) A simple pan-evaporation model for analysis of climate simulations: Evaluation over Australia. *Geophysical Research Letters,* 33.
4. Redmond, K. T. (2007) Evaporation and the hydrologic budget of Crater Lake, Oregon. *Hydrobiologia,* 574**,** 29-46.
5. Palmroth, S., G. G. Katul, D. Hui, H. R. McCarthy, R. B. Jackson, and R. Oren (2010), Estimation of long-term basin scale evapotranspiration from streamflow time series, *Water Resour. Res*., 46, W10512, doi:10.1029/2009WR008838.

Week 4

6. Storck, P., D. P. Lettenmaier & S. M. Bolton (2002) Measurement of snow interception and canopy effects on snow accumulation and melt in a mountainous maritime climate, Oregon, United States. *Water Resources Research,* 38.
7. Liu, F. J., M. W. Williams & N. Caine (2004) Source waters and flow paths in an alpine catchment, Colorado Front Range, United States. *Water Resources Research,* 40.
8. Konrad, C. P. (2006) Location and timing of river-aquifer exchanges in six tributaries to the Columbia River in the Pacific Northwest of the United States. *Journal of Hydrology,* 329**,** 444-470.

Week 5

9. Cayan, D. R. & K. P. Georgakakos (1995) HYDROCLIMATOLOGY OF CONTINENTAL WATERSHEDS .2. SPATIAL ANALYSES. *Water Resources Research,* 31**,** 677-697.
10. Cowell, C.M. and Urban, M. (2010) The changing geography of the U.S. water budget: Twentieth-century patterns and the twenty-first-century projections. *Annals of the Assoc. Am. Geog.*, 100: 740-754.

Week 7

11. Georgakakos, K. P., D. H. Bae & D. R. Cayan (1995) HYDROCLIMATOLOGY OF CONTINENTAL WATERSHEDS .1. TEMPORAL ANALYSES. *Water Resources Research,* 31**,** 655-675.

Week 8

12. Ning, S. K., N. B. Chang, K. Y. Jeng & Y. H. Tseng (2006) Soil erosion and non-point source pollution impacts assessment with the aid of multi-temporal remote sensing images. *Journal of Environmental Management,* 79**,** 88-101.
13. Wang, J., Hong, Y., Gourley, J., Adhikari, P., Li, L., and Su, F. (2010) Quantitative assessment of climate change and human impacts on long-term hydrologic response: a case study in a sub-basin of the Yellow River, China, *International Journal of Climatology* 30, doi: 10.1002/joc.2023

Week 10

14. Dankers, R. & L. Feyen (2008) Climate change impact on flood hazard in Europe: An assessment based on high-resolution climate simulations. *Journal of Geophysical Research-Atmospheres* 113, D19105, doi:10.1029/2007JD009719
15. Benito, G., A. Diez-Herrero & M. F. de Villalta (2003) Magnitude and frequency of flooding in the Tagus basin (Central Spain) over the last millennium. *Climatic Change,* 58**,** 171-192.

Week 11

16. Smakhtin, V. U. (2001) Low flow hydrology: a review. *Journal of Hydrology,* 240**,** 147-186.
17. Robeson, S.M. (2008) Applied climatology: Drought, *Progress in Physical Geography*, doi: 10.1177/0309133308091951

Week 13

18. Baldwin, C.K. and Lall, U., 1999, Seasonality of streamflow: The upper Mississippi River, *Water Resources Research*, vol. 35, no. 4, pp. 1143~1154
19. Groisman, P.Y., Knight, R.W. and Karl, T.R., 2001, Heavy Precipitation and High Streamflow in the Contiguous United State: Trends in the Twentieth Century, *Bulletin of the American Meteorological Society*, vol. 82, no. 2, pp. 219~246

Week 14

20. Krysanova, V., D. I. Muller-Wohlfeil & A. Becker (1998) Development and test of a spatially distributed hydrological water quality model for mesoscale watersheds. *Ecological Modelling,* 106**,** 261-289.
21. Grove, M., Harbor, J., Engel, B. and Muthukrishnan, S. (2001) Impacts of urbanization on surface hydrology, Little Eagle Creek, Indiana, and analysis of LTHIA model sensitivity to data resolution, *Physical Geography* 22, 135~153
22. Legesse, D., Vallet-Coulomb, C. and Gasse, F. (2003) Hydrological response of a catchment to climate and land use changes in Tropical Africa: case study South Central Ethiopia, *Journal of Hydrology* 275, 67~85

Week 15

23. Aspinall, R. & D. Pearson (2000) Integrated geographical assessment of environmental condition in water catchments: Linking landscape ecology, environmental modelling and GIS. *Journal of Environmental Management* 59**,** 299-319.