Geog 515 Watershed Analysis and Modeling: Spring 2014

Time and location

3:30 pm – 4:45 pm, Mon/Wed, BOL 281
Computer lab on the dates specified in the syllabus

Instructor

Name: Dr. Woonsup Choi
Office hours: Tue 2:00 pm – 2:30 pm and Wed 11:00 am – 11:30 am
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Course Description

The course provides students with theories and applications of analytical and modeling techniques for watershed processes, including geographic information systems (GIS), statistics, and computer simulations. The course will address almost every physical aspect of a watershed that can be quantitatively analyzed and modeled, such as topography, climate, hydrology, and land use.

Learning outcome

The course is intended to enable students to be able to:

- Create a base map of a study region including watersheds, streams, and lakes;
- Analyze a digital elevation model of land surface terrain to derive watershed and stream networks;
- Conduct basic statistical analysis of hydrological and climatological data, both temporal and spatial;
- Set up a watershed model for a particular study region and calibrate it

Prerequisite

Junior standing; or graduate standing. Geog 415, Geo Sci 463 or Geo Sci 562 recommended. Working knowledge of GIS required.

Course material

- Customized course packet / in-class handout
- Computer software: ArcGIS, Matlab, ArcSWAT
- Reading list for graduate students
- This course requires that a student has access to a PC with Windows OS and the Internet
- A student must carry a USB flash drive with capacity of at least 1 GB

Time commitment for the course

Credit hours: 3

- Time in classroom: 1.25hrs*2*15 = 37.5 hrs
- Time for completing assignments: 5 hrs*7 = 35 hrs
- Time to study for exams: 5 hrs*2 = 10 hrs
- Time for preparation and study: 2 hrs*2*15 = 60 hrs
- Time to prepare for article review: 5 hrs

- Time for graduate project: 30 hrs (graduate student only)
- Time for graduate presentation: 5 hrs (graduate student only)

Total hours for undergraduate: 147.5 hrs
Total hours for graduate: 182.5 hrs

Requirement

- Exams: Mid-term and final exams will be given. Students are allowed to use their books and other materials for the exam. Questions generally require either calculation or interpretation of data. A review session will be offered before each exam.
- Assignments: Assignments will be given approximately every other week to provide students with opportunities to apply concepts and practice skills. Students will solve specific problems using the techniques taught in the class. Early in the course, each student will choose a watershed of his/her interest, and will continue to work on them for assignments. The lowest assignment score will be dropped from calculation of the final grade.
- Article review: undergraduate students will have to write a review of an article presented by a graduate student. Each written discussion is due within two weeks from the article's presentation. Up to three 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. The grading rubric will be on D2L-Content.
- Participation: Attendance and participation in class discussion are expected to all students. Posting substantive comments to reading and term paper presentations on D2L-Discussion will count towards your participation score
- Requirements for **graduate students** only
  - Presentation: graduate students will have to choose and read an article from the reading list and present in class for discussion. The presentation should be of sufficient detail, taking about 30 minutes. The presenter should acquire sufficient (not complete, though) knowledge of the research design to present. Therefore choose early, and prepare well in advance.
  - Term paper: graduate students will have to write a term paper based on a research project. 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 is strongly encouraged to make an appointment with the UWM Writing Center after submitting a proposal and before submitting a final paper to discuss his/her term paper. The grading rubric will be on D2L-Content. Detailed instruction for the term paper will be provided later in class.

Evaluation

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

	Undergraduate	Graduate	Grading scale
Exams	120	140	A: over 90%, A-: over 87%,
Assignments	240	240	B+: over 83%, B: over 80%, B-: over 77%,
Reading presentation	N/A	60	C+: over 73%, C: over 70%, C-: over 67%,
Term paper	N/A	140	D+: over 64%, D: over 62%, D-: over 60%,
Article review	20	N/A	F: 60% or lower
Participation	20	20	
TOTAL	**400**	**600**	

Other course policy

- Units of data: All units of data used in students' work must be in SI, except for unavoidable situations
- 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 both lecture and lab 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.
- Late penalty: 20% deduction of your score you would receive with an on-time submission. No score after seven full days from the deadline.
- 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

Tentative course schedule

Week	Date	Class content	Reading	Assignment	Room
1	20-Jan	(MLK Day)			
	22-Jan	Course introduction; Re-introduction to hydrological cycle			
2	27-Jan	Select your watershed			
	29-Jan	Select your watershed		#1 handed out	Lab
3	3-Feb	Select your watershed-presentation Land use analysis			
	5-Feb	Topography analysis	Awasthi 2002		
4	10-Feb	Topography analysis	Cai 2006	#1 due	
	12-Feb	Topography analysis		#2 handed out	Lab
5	17-Feb	Precipitation analysis	Lin 2008		
	19-Feb	Precipitation analysis			
6	24-Feb	Evapotranspiration modeling	Zhang 2012	#2 due	
	26-Feb	Evapotranspiration modeling		#3 handed out	Lab
7	3-Mar	Runoff analysis			
	5-Mar	Runoff analysis			
8	10-Mar	Runoff analysis	Kienzle 2013	#3 due	
	12-Mar	Runoff analysis	Gubareva 2011	#4 handed out	Lab

9	17-Mar	(Spring break)			
	19-Mar	(Spring break)			
10	24-Mar	Runoff modeling	Ouyang 2012		
		Term paper proposal due			
	26-Mar	Runoff modeling		#4 due #5 handed out	Lab
11	31-Mar	Runoff modeling			
	2-Apr	Runoff modeling	Baker 2013		
12	7-Apr	Review for exam		#5 due	Lab
	9-Apr	**EXAM 1**		#6 handed out	
13	14-Apr	Runoff modeling			
	16-Apr	Runoff modeling	ASCE 1993		Lab
14	21-Apr	Runoff modeling	Legates 1999	#6 due	
		Term paper preliminary report due			
	23-Apr	Runoff modeling		#7 handed out	Lab
15	28-Apr	Runoff modeling	Cho 2013		
	30-Apr	Term paper presentation			
16	5-May	Term paper presentation		#7 due	
	7-May	Review for exam			
	14-May	**EXAM 2 (3:00-5:00 pm)**			
		TERM PAPER DUE (11:59 pm)			

Reading list for graduate students (suggestions are welcome)

1. Awasthi, K. D., B. K. Sitaula, B. R. Singh, and R. M. Bajacharaya. 2002. Land-use change in two Nepalese watersheds: GIS and geomorphometric analysis. *Land Degradation & Development* 13 (6): 495-513.
2. Cai X., Wang D., 2006. Spatial autocorrelation of topographic index in catchments. *Journal of Hydrology*. 328(3-4).
3. Lin W., Chou W., Lin C., Huang P., Tsai J., 2008. WinBasin: Using improved algorithms and the GIS technique for automated watershed modelling analysis from digital elevation models. *Int.J.Geogr.Inf.Sci*. 22(1), 47-69.
4. Zhang Q., Singh V.P., Li J., Jiang F., Bai Y., 2012. Spatio-temporal variations of precipitation extremes in Xinjiang, China. *Journal of Hydrology*. 434.
5. Gubareva T.S., 2011. Types of probability distributions in the evaluation of extreme floods. *Water Resour*. 38(7).
6. Kienzle, Stefan W., and Markus Mueller. 2013. Mapping Alberta's surface water resources for the period 1971-2000. *The Canadian Geographer / Le Géographe Canadien* 57 (4): 506-18.
7. Ouyang Y., 2012. A potential approach for low flow selection in water resource supply and management. *J.Hydrol*. 454, 56-63.
8. Baker, Tracy J., and Scott N. Miller. 2013. Using the soil and water assessment tool (SWAT) to assess land use impact on water resources in an east African watershed. *Journal of Hydrology* 486: 100-11.
9. ASCE. 1993. Criteria for evaluation of watershed models. *Journal of Irrigation and Drainage Engineering* 119 (3): 429-42
10. Legates D.R., McCabe Jr. G.J., 1999. Evaluating the use of "goodness-of-fit" measures in hydrologic and hydroclimatologic model validation. *Water Resources Research*. 35, 233-241.
11. Cho, Jaepil, David Bosch, George Vellidis, Richard Lowrance, and Timothy Strickland. 2013. Multi-site evaluation of hydrology component of SWAT in the coastal plain of southwest Georgia. *Hydrological Processes* 27 (12): 1691-700