The Hydrologic Cycle and Water Resources Management - EAS 579

Revised January 8, 2022

Academic semester: Winter
Academic year: 2021 - 2022 (typically repeated annually each winter)
Class schedule: Tuesdays/Thursdays 10:00am – 11:30am
Location (see note below): 1024 Dana Building (lectures held in-person only)

As of January 6, 2021, class will be presented in person only following University safety protocols.

Instructor: Andrew Gronewold, Ph.D., P.E., Associate Professor
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office phone: 734-764-6286
Dana building, Office 2008
School for Environment and Sustainability

Office hours: [In person: through April 19th – afterwards by appointment]
Tuesdays [all Tuesdays *except* 3/8, 3/15]: Noon to 1:00pm
Fridays [1/21, 2/11, 2/25, 3/18, 4/1, 4/15 *only*]: 10:00am to 11:30am
Fridays [1/28, 2/4, 2/18, 3/11, 3/25, 4/8 *only*]: Noon to 1:30pm

GSI: Hannah Paulson, Graduate Student
School for Environment and Sustainability
E-mail: paulsonh@umich.edu
Office hours: [Via Zoom: https://umich.zoom.us/j/91265006264, pw: 1234]
Wednesdays: 11:00am to Noon

Statement related to recordings

Course lectures may be audio/video recorded and made available to other students in this course. As part of your participation in this course, you may be recorded. If you do not wish to be recorded, please contact the instructor (drewgron@umich.edu) to discuss alternative arrangements. Students may not record or distribute any class activity without written permission from the instructor, except as necessary as part of approved accommodations for students with disabilities. Any approved recordings may only be used for the student's own private use.

Note regarding COVID: As they have throughout the past year-and-a-half, policies around academic and public health are subject to change as the pandemic evolves. This course will follow all policies issued by the University, which are documented on the Campus Blueprint's FAQ. These policies may change over the course of the term, so please review the Campus Blueprint's FAQ for the most up to date information.

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Masking: A face covering is required for anyone in a campus building or on campus transit, regardless of vaccination status. The policy applies across the entire University, including in the classroom. You can read a copy of the policy here.

I. Overview

BASIC DESCRIPTION: This course provides an introduction to the hydrologic cycle, and addresses implications of changes in the hydrologic cycle on water resources management. Students will develop an understanding of the major components of the hydrologic cycle, including precipitation, interception, soil water storage, runoff, streamflow, and groundwater flow. Case studies and representative problems will be derived from real-world applications to the Great Lakes and other regional hydrologic systems.

Students will be expected to have a University-level proficiency in algebra, along with successful completion of a University-level chemistry course and physics course. Basic mathematical analysis and problem sets will be integral parts of this course.

TEXTS:

The course will utilize the following required text:

- Brooks, K.N., Ffolliott, P.F., and Magner, J.A.. 2012. **Hydrology and the Management of Watersheds**, **4th edition**. Ames, Iowa: Wiley Blackwell. (***Available on-line through U of M library****)

Additional recommended reading:

- Hornberger, G.M., Raffensperger, J.P., Wiberg, P.L., Eshleman, K.N. 2014 (2nd edition). **Elements of Physical Hydrology**. Baltimore, Maryland: Johns Hopkins University Press.

METHOD OF EVALUATION:

Students will be evaluated based on a combination of a semester-long course project and weekly homework assignments:

ITEM	PERCENTAGE OF FINAL GRADE
Course project (due in phases)	25%
Homework assignments (roughly bi-weekly)	75%
TOTAL	100%

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II. Learning objectives

The objective of this course is to provide a solid foundation of fundamental knowledge in watershed hydrology using quantitative problem sets and interpretation of results with respect to policy and management decisions.

III. Learning outcomes

Students will meet for class twice per week throughout the semester for a lecture-style presentation. Progress in the course will be expected through outside-of-class readings and homework assignments. Students may also (in some years – not W2021) be evaluated using mid-term exams and a final exam. By the end of this course, students are expected to demonstrate proficiency in:

- The fundamentals of the hydrologic cycle, including major components of the water balance
- Implications of changes in the hydrologic cycle and hydrological processes on water resources and environmental management

IV. Course schedule (see next page; subject to change)

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NOTE: Syllabus may change; check the course web site or Canavs for the latest version				
Week	**Day(s)**	**Lecture Topic(s)**	**Reading (Brooks)**	**Due Dates (Numbers are for HW; see note at bottom)**
1	Thursday – Jan 6	Course Introduction – Begin Part I		
2	Tuesday – Jan 11 Thursday – Jan 13	Part 1 – Watersheds: key terms and concepts Part 1 – Watersheds: the hydrologic cycle, water and energy budgets	*Chapter 1*: **1 – 26** *Chapter 2*: **27 – 42**	
3	Tuesday – Jan 18 Thursday – Jan 20	Part 2 – Precipitation: measurement Part 2 – Precipitation: analysis of data ***(Overview of project options)***	*Chapter 3:* **49 – 59** *Chapter 3:* **59 – 63**	
4	Tuesday – Jan 25 Thursday – Jan 27	Part 2 – Precipitation: processes and snow hydrology Part 3 – Evapotranspiration (ET): canopy interception, net precipitation	*Chapter 3:* **63 – 79** *Chapter 4 (all)*	1 (due Jan 27)
5	Tuesday – Feb 1 Thursday – Feb 3	Part 3 – ET: evaporation and transpiration Part 3 – ET: potential/actual ET	*Chapter 4 (all)* *Chapter 4 (all)*	Project proposal due Feb 1
6	Tuesday – Feb 8 Thursday – Feb 10	Part 4 - Soil water: soil moisture Part 4 - Soil water: water flow in soil, infiltration	*Chapter 5 (all)*	
7	Tuesday – Feb 15 Thursday – Feb 17	Part 4 - Soil water: infiltration Part 5 - Groundwater: aquifers, flow	*Chapter 5 (all)* *Chapter 7*	2 (due Feb 17)
8	Tuesday – Feb 22 Thursday – Feb 24	Part 5 – Groundwater aquifers, flow (cont'd) Part 5 – Groundwater aquifers, flow		
9	Tuesday – Mar 1 Thursday – Mar 3	**SPRING BREAK WEEK - NO CLASSES**		
10	Tuesday – Mar 8 Thursday – Mar 10	Part 6 – Runoff and streamflow hydrographs, stormflow Part 6 - Runoff and streamflow: stormflow, flood routing	*Chapter 6*	3 (due Mar 10)
11	Tuesday – Mar 15 Thursday – Mar 17	**Guest lecture** **Guest lecture**		
12	Tuesday – Mar 22 Thursday – Mar 24	Part VI - Runoff and streamflow: measurement and monitoring Part VI - Runoff and streamflow: monitoring (cont'd)	*Chapter 6*	4 (due Mar 24)
13	Tuesday – Mar 29 Thursday – Mar 31	Part VII - Sediment, soil, erosion, pollutants: sediment, USLE Part VII - Sediment, soil, erosion, pollutants: RSLE, erosion, pollutants	*Chapter 8 (198-210)*	Project draft submittal **April 1 - April 13 (see note below)**
14	Tuesday – Apr 5 Thursday – Apr 7	Watershed and water resources management: CS 1 **Guest lecture** Watershed and water resources management: CS 2	See web-site	
15	Tuesday – Apr 12 Thursday – Apr 14	Watershed and water resources management: CS 3 **Guest lecture** Watershed and water resources management: case study 3 (cont'd)	See web-site	5 (due April 14)
16	Tuesday – Apr 19	Watershed and water resources management: case study 4	See web-site	**FINAL PROJECTS due by 5pm on Tues April 26 (via Canvas)**
	Apr 20, 23-24	UNIVERSITY STUDY PERIOD		
	Apr 21, 22, 25-28	UNIVERSITY EXAM PERIOD		
	NOTE 1: Homework assignments are to be submitted via Canvas by 5pm on the due date			
	NOTE 2: Project drafts may be submitted **once** during the window; we will do make every effort to return comments within 48 hours of submittal. Please upload your drafts to Canvas when you are ready for them to be graded, and please send an e-mail to the instructors so he/she is aware the draft has been uploaded and is ready for grading.			