The Hydrologic Cycle and Water Resources Management
EAS 501.077
Revised 09 January 2020

Academic semester: Winter
Academic year: 2019-2020 (expected to be repeated annually each winter)
Class schedule: Tuesdays/Thursdays 10:00am – 11:30am

Instructor:

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Dana building, Office 4040
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Department of Earth and Environmental Science

Office hours: Tuesdays/Thursdays - 12:30pm – 2:00pm

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. **Mathematical analysis and problem sets will be integral parts of this course.**

TEXTS:

The course will utilize the following required text(s):

- 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.

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METHOD OF EVALUATION: Students will be evaluated based on a combination of a semester-long course project, bi-weekly homework assignments, two mid-term exams, and a final exam:

ITEM	PERCENTAGE OF FINAL GRADE
Course project (due at end of semester)	15%
Homework assignments (biweekly, due at beginning of designated class)	40%
Mid-term exams (2) – each 15%	30%
Final exam	15%
TOTAL	100%

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 will also be evaluated using two 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 on water resources management
- Relationships between climate change and the water balance at regional and global scales

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

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NOTE: Syllabus may change; check the course web site for the latest version – revised 04 Jan 2020				
Week	**Day(s)**	**Lecture Topic(s)**	**Reading (Brooks)**	**HW**
1	Thursday – Jan 9	Introduction		
2	Tuesday – Jan 14 Thursday – Jan 16	Part I – Watersheds: key terms and concepts Part I – Watersheds: the hydrologic cycle, water and energy budgets	*Chapter 1*: **1 – 26** *Chapter 2*: **27 – 42**	
3	Tuesday – Jan 21 Thursday – Jan 23	Part II – Precipitation: process and measurement Part II – Precipitation: analysis of data ***(Overview of project options)***	*Chapter 3:* **49 – 59** *Chapter 3:* **59 – 63**	
4	Tuesday – Jan 28 Thursday – Jan 30	Part II – Precipitation: snow hydrology Part III – Evapotranspiration (ET): canopy interception, net precipitation	*Chapter 3:* **63 – 79** *Chapter 4 (all)*	1 (due Jan 28)
5	Tuesday – Feb 4 Thursday – Feb 6	Part III – ET: evaporation and transpiration Part III – ET: potential/actual ET ***(CASE STUDY: Dr. Bhattarai)***	*Chapter 4 (all)* *Chapter 4 (all)*	
6	Tuesday – Feb 11 Thursday – Feb 13	**EXAM 1 (in class)** Part IV - Soil water: soil moisture	- *Chapter 5 (all)*	2 (due Feb 11)
7	Tuesday – Feb 18 Thursday – Feb 20	Part IV - Soil water: water flow in soil and infiltration Part IV - Soil water: infiltration	*Chapter 5 (all)* *Chapter 5 (all)*	
8	Tuesday – Feb 25 Thursday – Feb 27	Part V. Groundwater: aquifers and groundwater systems Part V. Groundwater: groundwater flow	*Chapter 7* *Chapter 7*	3 (due Feb 27)
9	*Tuesday – Mar 3* *Thursday – Mar 5*	*NO CLASS: VACATION*	- -	
10	Tuesday – Mar 10 Thursday – Mar 12	Part V. Groundwater: surface water – groundwater connections Part VI - Runoff and streamflow: pathways, hydrographs	*Chapter 7* *Chapter 6*	
11	Tuesday – Mar 17 Thursday – Mar 19	Part VI - Runoff and streamflow: measurement and monitoring Part VI - Runoff and streamflow: stormflow (***CASE STUDY: Dr. Do***)	*Chapter 6* *Chapter 6*	4 (due Mar 19)
12	Tuesday – Mar 24 Thursday – Mar 26	Part VI - Runoff and streamflow: flood routing **EXAM 2 (in class)**	*Chapter 6* -	
13	Tuesday – Mar 31 Thursday – Apr 2	Sediment, erosion, geomorphology: sediment, energy Sediment, erosion, geomorphology: channel morphology	TBD	5 (due Apr 2)
14	Tuesday – Apr 7 Thursday – Apr 9	Sediment, erosion, geomorphology: surface erosion and USLE Sediment, erosion, geomorphology: surface erosion and USLE	TBD	
15	Tuesday – Apr 14 Thursday – Apr 16	Watershed management, water quality: case study 1 Watershed management, water quality: case study 2	TBD	6 (due Apr 16)
16	Tuesday – Apr 21	Watershed management, water quality: water quality metrics	TBD	Projects (Apr 21)
		FINAL EXAM (date TBD, during exam period)		
	Apr 22, and 25-26	STUDY PERIOD		
	Aprl 23-24, 27-30	EXAM PERIOD		