

GEO421: Hydrology
 Fall 2019
 University of Montana
 Instructor: Marco Maneta
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 Office: CHCB 317
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 Class meetings: M-W-F 1:10pm-2:00pm

Learning outcomes: In this course students will develop the skills to

- Evaluate how the impact (either natural or anthropic) on any component of the hydrologic cycle at the global or at the watershed scale will propagate in the system.
- Understand the mechanisms that govern water fluxes in natural environments.
- Apply technical knowledge to quantify fluxes and storages of water and energy in the different components of the hydrologic cycle.

Ancillary goals: Along with the overarching goals, in this course students will improve their quantitative skills, will get used to accessing and reading the professional literature and will improve their capabilities to acquire knowledge independently.

Prerequisites: College calculus and college physics. Computer literacy is expected, since some of the exercises will involve using MS-Excel. Since it is a senior year course, it is also expected that students have the ability to fill-in any gaps they may have in their background in order to follow the lectures and the readings.

Office hours: Office hours will be the next hour after class.

Grades: 50% class activities and assignments - 50% exams.

Text book: S L Dingman(2015). Physical Hydrology (3rd edition). Waveland Press. Long Grove, Illinois

Assignments:

Class activity 1: Watershed delineation and mass balance model at the watershed scale in Excel

Class activity 2: Energy balance for the Earth

Class activity 3: Snowmelt model

Class activity 4: Energy balance at the watershed scale.

Class activity 5: Calculate water depth for a given discharge in a channel using Manning's eq and N-R

Class activity 6: Classic hydrology models at the watershed scale

Course Content (tentative):

Unit	Topic	Reading/Activities
1	Fundamentals of Fluid Dynamics. Energy, mass and momentum transfer concepts. Control volume concept and continuity.	Dingman p 9-13, App. B.1,B.2 Dingman p 13-23 Class activity 1
2	Earth's energy balance and the hydrologic cycle at the global scale. Basic climates and distribution of water in the World.	Dingman p 47-54 Class activity 2 Dingman p 55-59,63-79
3	Principles of turbulent exchanges Precipitation events and their characteristics	Dingman 111-131 and 133-146
4	Snow and snowmelt. Importance of snow as a water reservoir. Spatial distribution of snow. Cold content of snow and snow pack processes.	Dingman 205-209, Dingman 221-234 Class activity 3
5	Evapotranspiration. Potential and actual evapotranspiration. Mass and energy balance approaches to estimating evaporation.	Dingman 253-257 Dingman 275-282 Brutsaert & Parlange('98) Class activity 4

6	Groundwater hydrology. Groundwater balance components. Storage and yields	Dingman 313-328, 389-394,408-414
7	Vadose zone hydrology. Soil potential and water retention curves. Darcy's equation in variable saturated porous media. Richards' equation.	Dingman 328-339 Dingman 345-350
8	Overland, channel flow and stream networks. Runoff generation mechanisms. Flow routing. Manning's equation. Kinematic wave.	Dingman 432-435 Dunne & Leop 478-502 Class activity 5
9	Rainfall-Runoff relationships. Watershed response to atmospheric input. Classical approaches. Rational method, unit hydrograph, SCS curve.	Dingman 503-504 Class activity 6
10	FINAL	Date TBD

Policies

Attendance: No formal attendance will be taken. However, the format of this course requires class attendance for success. Substantial course content (i.e., graded in-class exercises and discussions) and information transfer will only occur in class. We cannot accommodate individual make-ups for missed classes. This is not a good course for you if you expect to miss class, even occasionally.

Emailing: We may occasionally conduct email correspondence with class members and we will use official UM email addresses. All email sent to us must originate from your official UM email address. Email originating from non-UM addresses cannot be read or responded to (Sorry, but this is a law we are required to follow).

Due dates: All assignments are due at the start of class on designated due date.

Disabilities: The University of Montana assures equal access to instruction through collaboration between student with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or 4062432243. I will work with you and Disability Services to provide an appropriate modification.

Conduct Code: All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at:
http://www.umt.edu/vpsa/policies/student_conduct.php