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GEO 421.01: Hydrology

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GEO421: Hydrology
 Fall 2021
 University of Montana
 Instructor: Marco Maneta
 Email: marco.maneta@umontana.edu
 Office: CHCB 317
 Phone: 406-243-2454
 Class meetings: M-W-F 1:10pm-2:00pm

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

- Understand the hydrologic cycle, the basic properties of water and their relevance to the Earth system.
- Understand the physics of water flow and how to represent it with the mass, momentum and energy conservation equations.
- Apply technical knowledge to quantify fluxes and storages of water and energy in the critical zone.

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. Some computer literacy is expected, since some of the assignments involve calculations with a computer (using MS Excel and the Python programming language).

Office hours: Office hours by appointment.

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: How is water reapportioned in the global hydrocycle?
 Class activity 2: Energy balance of the Earth
 Class activity 3: Watershed delineation and mass balance model at the watershed scale
 Class activity 4: Fundamentals of fluid motion
 Class activity 5: Turbulent exchanges problems set
 Class activity 6: Snowmelt model
 Class activity 7: Richards equation problem set
 Class activity 8: Open channel hydraulics

Course Content (tentative):

Unit	Topic	Reading/Activities
1	Earth's water and energy balance at global scales. Distribution of water in the World. distribution of water in the World.	Dingman p 47-54 Class activity 1 and 2 Digman p 55-59,63-79
2	Catchment Hydrology. Components of the regional water balance, Catchment processes (precipitation, interception, evapotranspiration, infiltration, percolation, runoff)	Dingman p 13-28 Class activity 3
3	Fundamentals of Fluid Dynamics. Energy, mass and momentum transfer concepts. Control volume concept and continuity.	Dingman p 9-13, App. B.1,B.2 Class activity 4
4	Principles of turbulent exchanges Precipitation and Evapotranspiration Mid-term	Dingman 111-131 and 133-146 Class activity 5
5	Snow and snowmelt. Importance of snow as a water reservoir. Spatial distribution of snow. Cold	Dingman 205-209, Dingman 221-234

content of snow and snow pack processes.	Class activity 6
6 Vadose zone hydrology. Soil potential and water retention curves. Darcy's equation in variable saturated porous media.	Dingman 328-339
Richards' equation.	Dingman 345-350
7 Overland, channel flow and stream networks.	Class activity 7
Runoff generation mechanisms. Flow routing.	Dingman 432-435
Manning's equation. Kinematic wave.	Dunne Leop 478-502
FINAL	Class activity 8
	Thursday Nov 19 1:10-3:10

Policies

COVID-19 safety:

- Mask use is required within the classroom.
- If you feel sick and/or are exhibiting COVID-19 symptoms, please don't come to class and contact the Curry Health Center at (406) 243-4330.
- If you are required to isolate or quarantine, you will receive support in the class to ensure continued academic progress. Please notify your professors at your earliest ability to make arrangements.
- UM recommends students get the COVID-19 vaccine. Please direct your questions or concerns about vaccines to Curry Health Center.
- Where social distancing (maintaining consistent 6 feet between individuals) is not possible, specific seat seating arrangements will be used to support contact tracing efforts.

Attendance: Attendance will not formally enforced or monitored. 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