Fall 9-2015

GEO 421.01: Hydrology

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GEO421: Hydrology
Fall 2015
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

Overarching goals: 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	The importance of water. Open and closed systems.	Dingman p 9-13, App. B.1,B.2
	Energy, mass and momentum transfer concepts.	Dingman p 13-23
	Control volume concept and continuity.	Class activity 1
2	Earth's energy balance and the hydrologic cycle	Dingman p 47-54
	at the global scale. Basic climates and	Class activity 2
	distribution of water in the World.	Digman p 55-59,63-79
3	Principles of turbulent exchanges	Dingman 111-131
	Precipitatin events and their characteristics	and 133-146
4	Snow and snowmelt. Importance of snow as a water	Dingman 205-209,
	reservoir. Spatial distribution of snow. Cold	Dingman 221-234
	content of snow and snow pack processes.	Class activity 3
5	Evapotranspiration. Potential and actual	Dingman 253-257
	evapotranspiration. Mass and energy balance	Dingman 275-282
	approaches to estimating evaporation.	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	**MID TERM**	Most likely the last day of class before Thnxgvns
9	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
10	Rainfall-Runoff relationships. Watershed response to atmospheric input. Classical approaches. Rational method, unit hydrograph, SCS curve.	Dingman 503-504 Class activity 6
11	**FINAL**	Date TBD