9-2014

GEO 421.01: Hydrogeology

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GEO421: Hydrology
Fall 2014
University of Montana
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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(2002). Physical Hydrology (2nd 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. Energy, mass and momentum transfer concepts. Control volume concept and continuity.	Dingman p 7-13 Dingman p 529-547 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 36-64 Class activity 2
3	Precipitation mechanisms. Type of precipitation events and their characteristics	Dingman 94-107 and 589-593
4	Snow and snowmelt. Importance of snow as a water reservoir. Spatial distribution of snow. Cold content of snow and snow pack processes.	Dingman 166-207 Class activity 3
5	Evapotranspiration. Potential and actual evapotranspiration. Mass and energy balance approaches to estimating evaporation.	Dingman 272-275 Dingman 294-301 Brutsaert & Parlange('98) Class activity 4

6	Groundwater hydrology. Groundwater balance components. Storage and yields	Dingman 325-358
7	Vadose zone hydrology. Soil potential and water retention curves. Darcy's equation in variable saturated porous media. Richards' equation.	Dingman 220-242 Dingman 245-255
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 633-646 Class activity 5
10	Rainfall-Runoff relationships. Watershed response to atmospheric input. Classical approaches. Rational method, unit hydrograph, SCS curve.	Dingman 389-424 Class activity 6
11	**FINAL**	Date TBD