Fall 9-2015

**GEO 421.01: Hydrology**

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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.

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):

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Reading/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The importance of water. Open and closed systems. Energy, mass and momentum transfer concepts. Control volume concept and continuity.</td>
<td>Dingman p 9-13, App. B.1,B.2</td>
</tr>
<tr>
<td>2</td>
<td>Earth’s energy balance and the hydrologic cycle at the global scale. Basic climates and distribution of water in the World.</td>
<td>Dingman p 47-54, Class activity 2, Digman p 55-59,63-79</td>
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<tr>
<td>3</td>
<td>Principles of turbulent exchanges Precipitatin events and their characteristics</td>
<td>Dingman 111-131 and 133-146</td>
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<tr>
<td>4</td>
<td>Snow and snowmelt. Importance of snow as a water reservoir. Spatial distribution of snow. Cold content of snow and snow pack processes.</td>
<td>Dingman 205-209, Dingman 221-234, Class activity 3</td>
</tr>
</tbody>
</table>
   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 Thnxgyns
   Dunne & Leop 478-502
   Dingman 503-504
11 FINAL
   Date TBD