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 7-13 Dingman p 529-547 Class activity 1</td>
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<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 36-64 Class activity 2</td>
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<tr>
<td>3</td>
<td>Precipitation mechanisms. Type of precipitation events and their characteristics</td>
<td>Dingman 94-107 and 589-593</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 166-207 Class activity 3</td>
</tr>
</tbody>
</table>
7 Vadose zone hydrology. Soil potential and water retention curves. Darcy’s equation in variable saturated porous media. Richards’ equation.

8 MID TERM
11 FINAL

Most like the last day of class before Thxgyns
Dingman 325-358
Dingman 220-242
Dingman 245-255

Dingman 432-435
Dunne & Leop 633-646
Class activity 5
Class activity 6

Dingman 389-424
Class activity 6

Date TBD