**CEE690-06: Environmental Spatial Data Analysis**

**Fall 2019**

**Course Information**

Lectures are on Tuesdays and Thursdays from 11:45 AM - 1:00 PM in Hudson Hall 139.

Office hours in FCIEMAS 2463. Day and time to be determined.

Course website on Sakai (CEE.690.02.Sp19)

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FCIEMAS 2463

**Course Description**

This course provides a process-based introduction to the different components of the terrestrial hydrologic cycle including precipitation, evapotranspiration, interception, snow hydrology, open-channel flow, flows in porous media, infiltration, and groundwater. An overview of catchment hydrology, frequency analysis, ecohydrology, and sociohydrology will also be presented.

**Prerequisites:** Although there are no class prerequisites, a strong foundation in computer programming is strongly encouraged. Please contact me with concerns.

**Textbooks**

* **None**

**Grades and Workload**

The course grade is based on three items:

* Homework: 40%
* Participation: 20%
* Final Project: 40%

**Homework:** There will be 8 homework assignments; these will cover a combination of comprehension, theoretical, and computational problems. The computational parts of these assignments will use Python via Jupyter notebooks; if you need to learn Python, Codecademy is a good resource: https://www.codecademy.com/learn/learn-python. Assignments given each Thursday will be due the following Thursday in class. The two homeworks with the lowest grades will be dropped. Late homeworks will not be accepted.

**Participation:** Students should prepare for class by reading the assigned textbook sections and journal articles. Each Tuesday we will begin with a 30 minute discussion of assigned journal article(s); each student will need to lead at least one of these discussions. Students should participate at least once in each article discussion and at least once in each class lecture.

**Collaboration:** Collaboration in completing assignments is permitted. Each student should write up their assignment independently.

**Final Project:** The final project includes three components:

* Proposal (March 19th via email)
  + 2 pages, Single-spaced, 12 point font size, 1 inch margin
  + Contains: Title, Introduction and Objectives, Methodology, and a timeline of tasks
* Oral presentation (April 23rd-25th in class)
  + AGU style, 12 minute oral presentation, 3 minutes for questions
  + *Everyone* needs to be present for each presentation
* Final report (May 4th via email)
  + 15 pages max (brevity is encouraged--only use what you actually need!)
  + Single-spaced, 12 point font size, 1 inch margin
  + Contains: Title, Abstract, Introduction, Method, Results, Conclusions

**Schedule & Readings**

Note that the schedule and readings are subject to change; changes will be announced in class and the online syllabus will be updated.

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| **Date** | **Material** | **General Readings** | **Assignments** |
| 01/10 | Global water balance | None |  |
| 01/15 | Precipitation I | Brutsaert Ch. 2.1,  Brutsaert Ch 3 | JA: Trenberth et al., 2007 |
| 01/17 | Precipitation II | HW #1 due |
| 01/22 | Evapotranspiration I | Brutsaert Ch. 3.4,2.6,4.1-4.2 | JA: Sun et al., 2017 |
| 01/24 | Evapotranspiration II | HW #2 due |
| 01/29 | Evapotranspiration III | Brutsaert Ch 2.2 - 2.5, 4.3-4.5 | JA: Wang et al., 2012 |
| 01/31 | Evapotranspiration IV | None |
| 02/05 | Snow hydrology I | Dingman Ch. 5 | JA: Maxwell et al., 2016 |
| 02/07 | Snow hydrology II | HW #3 due |
| 02/12 | Seminar | Hornberger Ch. 3 | JA: Barnett et al., 2005 |
| 02/14 | Porous media I | Brutsaert Ch. 8  Hornberger Ch.3, Ch.6.1-6.3 | HW #4 due |
| 02/19 | Porous media II | JA: None |
| 02/21 | Porous media III | HW #5 due |
| 02/26 | Vadose zone I | Brutsaert Ch. 9  Hornberger Ch. 8 | JA: Beven and Germann, 1982 |
| 02/28 | Vadose zone I | HW #6 due |
| 03/05 | Seminar | Brutsaert Ch. 10.1-10.5,  Hornberger Ch 6.4-6.5, 7.1-7.7 | None |
| 03/07 | Groundwater I | None |
| 03/12 | Spring break | | |
| 03/14 |
| 03/19 | Groundwater II | Brutsaert Ch. 10.1-10.5,  Hornberger Ch 6.4-6.5, 7.1-7.7 | Proposal due |
| 03/21 | Groundwater III | None |
| 03/26 | Catchment hydrology I | Brutsaert Ch 10.6,11 Hornberger Ch. 10 | JA: Toth, 1963 |
| 03/28 | Catchment hydrology II | HW #7 due |
| 04/02 | Free surface flow I | Brutsaert Ch. 5,  Hornberger Ch. 4 | JA: TBD |
| 04/04 | Free surface flow II | HW #8 due |
| 04/09 | Open channel flow I | Brutsaert Ch. 6,  Hornberger Ch. 5 | JA: TBD |
| 04/11 | Open channel flow II | None |
| 04/16 | Frequency analysis I | Brutsaert Ch. 13 | JA: TBD |
| 04/18 | Frequency analysis II | None |
| 04/23 | Oral presentations | | |
| 04/25 | Oral presentations | | |
| 05/04 | Written report due | | |