AGRON 590RD - Data Stewardship for Earth Systems Scientists
Fall 2016

Proposed Frequency: Once a year.

Class Time: XXX in XXX
Instructor: Andee Kaplan (`ajkaplan@iastate.edu`, Snedecor 3220), Ranae Dietzel (`rdietzel@iastate.edu`, 3403 Agronomy Hall)
Office Hours: XXX in XXX.
Web: `http://agron590-ISU.github.io`

Class Format
We meet three hours per week, twice for lecture periods and once for lab period. The labs will consist of directed individual and group work.

Optional Textbooks:

- Kimball, Ralph, and Margy Ross. *The data warehouse toolkit: The definitive guide to dimensional modeling*. John Wiley & Sons, 2013.
- Xie, Yihui. *Dynamic Documents with R and knitr*. Vol. 29. CRC Press, 2013.
- Wickham, Hadley. *ggplot2: elegant graphics for data analysis*. Springer Science & Business Media, 2009.

Course Objectives
There is a need for data stewardship in Earth systems science due to the scale and complexity brought about by simultaneously examining many natural phenomena and their interactions. Large, multi-investigator field experiments and datasets generated by the accumulation of data over time, automated data collection, and simulation models demand researchers capable of working beyond basic spreadsheets. However, students currently have little opportunity to learn fundamental data skills required for successful, collaborative, and reproducible research. AGRON 590RD will address this gap within the context of plant, soil, and atmospheric sciences by providing instruction to students ranging from those that have had little exposure to methods of working with data to students that have experience with data-heavy applications, but wish to improve the way in which they work.

Learning Outcome:
Students will become good data stewards through learning new tools to clearly organize, track, and communicate data-based work from data collection through analysis and publication. This will facilitate strong collaborative research skills and enable subsequent researchers to reproduce or expand upon completed projects. By creating a deeper understanding of data architectures and data manipulation, this course will prepare students to be Earth systems scientists with the ability to complete the entire research cycle in a responsible way.

Tentative Course Outline:

1. Learning to use the command line ..... Week 1

2. Git and the GitHub ecosystem ..... Week 1
3. Standards of reproducible data collection ..... Week 2
4. Relational Databases and SQL ..... Week 3-4
5. Data architecture ..... Week 5
6. Introduction to `R` ..... Week 6-7
7. Data munging and wrangling ..... Week 8-9
8. Visualization ..... Week 10
9. Reproducibility and Dynamic Documents ..... Week 11-12
10. External Data Sources ..... Week 13
11. Special Data Types ..... Week 14
12. Project presentations ..... Week 15

Assessment:
The following assessments will be made throughout the course. All assignments will be turned in and graded within the GitHub ecosystem. There will be no alternative method for submission. This will ensure that the students are learning best collaborative and reproducible practices, as well as reinforcing ideas about data.

Blog Posts
Weekly readings (journal articles, book chapters, blog posts, etc.) will be assigned and the students will be asked to write their opinions and understanding of the topic in a blog format. Blog posts will be discussed the following class day to encourage synthesis of the topic at hand.

Individual Homework:
3-5 individual homeworks will be assigned. These will primarily occur in the beginning of the course to ensure working knowledge of the GitHub ecosystem. All homework must be fully reproducible by the instructors.

Group Homework:
Groups of 2-3 students will be assigned by the instructor and there will be 2-3 group assignments through out the semester. This will be small, well-defined problems that will reinforce the concepts learned through collaborative and reproducible document generation within GitHub. All homework must be fully reproducible by the instructors.

Final Project:
A final project of the students' choosing. This should deal with a real world data issue, and will be completed in self-selected groups of no more than four students. Details to follow.

Component	Weight
Blog Posts	10%
Individual Homework	25%
Group Homework	25%
Project:	40%

Attendance:
Grades do not directly depend on attendance - still, experience shows that attendance and course performance are significantly related to each other. In order to get the most out of this course and do his or her personal best, it is necessary for a student to treat attendance as if it were mandatory.

Academic Honesty:
As an Iowa State University student, you have agreed to abide by the University's academic honesty policy (http://www.dso.iastate.edu/ja/academic/misconduct.html). Academic misconduct is a serious matter and student's suspected of academic dishonesty will be reported to the Dean of Students Office. Questions related to course assignments and the academic honesty policy should be directed to the instructor.

Disability Accommodation:
Iowa State University complies with the Americans with Disabilities Act and Sect 504 of the Rehabilitation Act. If you have a disability and anticipate needing accommodations in this course, please contact your instructor (in this case, Ian Mouzon) to set up a meeting within the first two weeks of the semester or as soon as you become aware of your need. Before meeting with the instructor, you will need to obtain a SAAR form with recommendations for accommodations from the Disability Resources Office, located in Room 1076 on the main floor of the Student Services Building. Their telephone number is 515-294-7220 or email disabilityresources@iastate.edu. Retroactive requests for accommodations will not be honored.

Dead Week:
This class follows the Iowa State University Dead Week policy as noted in section 10.6.4 of the Faculty Handbook http://www.provost.iastate.edu/resources/faculty-handbook .

Harassment and Discrimination:
Iowa State University strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment based upon race, ethnicity, sex (including sexual assault), pregnancy, color, religion, national origin, physical or mental disability, age, marital status, sexual orientation, gender identity, genetic information, or status as a U.S. veteran. Any student who has concerns about such behavior should contact his/her instructor, Student Assistance at 515-294-1020 or email dso-sas@iastate.edu, or the Office of Equal Opportunity and Compliance at 515-294-7612.

Religious Accommodation:
If an academic or work requirement conflicts with your religious practices and/or observances, you may request reasonable accommodations. Your request must be in writing, and your instructor or supervisor will review the request. You or your instructor may also seek assistance from the Dean of Students Office or the Office of Equal Opportunity and Compliance.

Contact Information:
If you are experiencing, or have experienced, a problem with any of the above issues, email academicissues@iastate.edu.