Course title and number	Introduction to Python for Geosciences (469/669)
Term	Spring 2020
Meeting times and location	O&M 303 (College Station) TR 12:45 – 2:00pm

Instructor Information

Dr. Rob Hetland
hetland@tamu.edu – 979-458-0096 – O&M 618D
Office hours by appointment.

Course Description and Prerequisites

This course provides an introduction to data analysis and graphical representation of geoscience data using the Python programming language. Topics include how to read and write data using standard formats; modern programming techniques including object oriented programming and the model-view-controller paradigm; plotting geophysical data using various projections, and best practices in plotting.

Prerequisites: None, but previous programming experience will be very helpful.
This class is being offered in person in College Station and over Google Hangouts for Galveston students.

Learning Outcomes or Course Objectives

Students will understand the basic concepts of programming. In particular, they will understand basic Python programming as typically used in the geosciences, that is, for one- and two-dimensional geospatial analysis for scientific applications. Students will be able to read in data files, perform analysis, and plot results in multiple formats with strong basic design principles.

Textbook and/or Resource Material

No required text. In-class laptop required.
Online course materials: https://github.com/hetland/python4geosciences.

Grading Policies

Homework will be assigned approximately every week, and in-class work is integral to the class and is graded accordingly. There will be a final project for all students.

The grading scale is 90-100% = A, 80-89% = B, 70-79% = C, etc.

For all students, homework will account for 70% of the grade, the final project 25%, and class participation 5%. Homework will be submitted online and graded automatically when possible. This means that your code needs to run to get points — you will not receive points for code that does not run. Homework is due at 11:59pm every Friday night. If you submit homework by the following Thursday night, your grade will be reduced by 10%, and if you submit by the second Friday night after, your grade will be reduced by 20%; after that it will be worth zero points. Undergraduate students will have access to the homework questions assigned to graduate students, and these problems can be completed for extra credit, though this is not required.

Academic Integrity

For additional information please visit: http://aggiehonor.tamu.edu
Students are encouraged to work together both in and out of class, but absolutely need to complete their own work and understand what they turn in. "An Aggie does not lie, cheat, or steal, or tolerate those who do."

Course Topics, Calendar of Activities, Major Assignment Dates (subject to change)
Homework is typically due every Friday night at midnight
This is superseded by schedule at https://github.com/kthyng/python4geosciences

Week 0–2: Course intro; Python basics — Core language
Using Jupyter notebooks and JupyterHub. Overview of the standard Python programming language, standard data containers (lists, tuples, dictionaries, etc), importing packages, for/while loops, functions, and object oriented programming (objects as containers for data and associated functions).

Week 3–4: Numerical Python
Numpy, vector operations, data types, and array broadcasting.

Week 5: Review
Review core language and numpy.

Week 5–7: Basic plotting in Python with matplotlib
Overview of the matplotlib plotting package: 1D (line plots, histograms), 2D (contours, pcolor).

Week 7–9: 1D time series analysis
pandas, indexing, averaging.

Week 9–10: Review
Review core, numpy, matplotlib, and pandas.

Week 10-12: 2D geospatial plotting
Cartopy mapping package and shapefiles. xarray: reading and writing NetCDF files locally and over the internet.

Week 12-13: Python beyond the notebook
Anaconda package installer, iPython for terminal window, writing scripts, Jupyterlab; debugging, unit testing.

Week 14: Share projects in groups
Share projects in groups and get feedback. Attendance is required.

Attendance and Make-up Policies

Attendance is highly recommended and part of your grade is based on in-class participation. If you will miss class, be sure to contact me ahead of time.

Americans with Disabilities Act (ADA)

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit http://disability.tamu.edu. Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.