Course title and number: Introduction to Python for Geosciences (OCNG 469 / 669)
Term: Spring 2019
Meeting times and location: Eller O&M Bldg rm 602 (O&M 602; OMB 602)

Instructor Information

Dr. Darren Henrichs
Email: dhenrichs@tamu.edu
Ph: 979-845-5738
Office: O&M 908A
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 and a presentation for the graduate students.

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

For all students, homework will account for 50% of the grade, class participation 25%, and the final project 25%. Graduate students will also present their final project. 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

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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.

Course Topics, Calendar of Activities, Major Assignment Dates (subject to change)
Homework is typically due every Friday night at midnight
Weeks 1-3 (Jan 15/17/22/24/29/31): Course intro; Python basics — Core language
Homework 01 due Jan 18, hw02 due Jan 25, hw03 due Feb 1
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).
Weeks 4-6 (Feb 5/7/12/14/19/21): Numerical Python
hw04 due Feb 8, hw05 due Feb 15, hw06 due Feb 22
Numpy, vector operations, data types, and array broadcasting.
Weeks 7-8 (Feb 26/28, Mar 5/7): Basic plotting in Python with matplotlib
hw07 due Mar 1, hw08 due Mar 8, Email project plan by Mar 8
Overview of the matplotlib plotting package: 1D (line plots, histograms), 2D (contours, pcolor). No class (Mar 12/14 for Spring Break)
Weeks 9-10 (Mar 19/21/26/28): 1D time series analysis
hw09 due Mar 22, hw10 due Mar 29
pandas, indexing, averaging.
Weeks 11-13 (Apr 2/4/9/11/16/18): 2D geospatial plotting
hw11 due Apr 5, hw12 due Apr 12
Cartopy mapping package and shapefiles. xarray: reading and writing NetCDF files locally and over the internet.
Week 14 (Apr 23/25): Group project presentations. *No final.*
hw13/project due Apr 29
Graduate students present, undergraduates and graduates give 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)
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

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