TEXAS A&M UNIVERSITY

SYLLABUS

Course title and number	469/669
Term	Spring 2018
Meeting times and location	O&M 602 (College Station) / CLB 210 (Galveston) TR 12:45 – 2:00pm

Instructor Information

Dr. Kristen Thyng
kthyng@tamu.edu – 979-845-0791 – O&M 607
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. Patience will be necessary at times for some technology issues, but I will work hard to keep this to a minimum.

Learning Outcomes or Course Objectives

Students will understand the basic concepts of programming. In particular, they will understand 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. They will be able to debug their code and create packages for use in future work.

Textbook and/or Resource Material

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

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

Week 0-2 (Jan 16/18/23/25/30, Feb 1): Course intro; Python basics — Core language
Homework 0 due Jan 19, hw1 due Jan 26, hw2 due Feb 2
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.

Week 3-5 (Feb 6/8/13 [no class]/15 [no class]/20/22): Numerical Python
hw3 due Feb 9, hw4 due Feb 16, hw5 due Feb 23
Numpy and scipy packages, vector operations, data types, and array broadcasting.

Week 6-7 (Feb 27, Mar 1/6/8): Basic plotting in Python with matplotlib
hw6 due Mar 2, hw7 due Mar 9, Email project plan by Mar 9
Overview of the matplotlib plotting package.

No class (Mar 13/15 for Spring Break)

Week 8-9 (Mar 20/22/27/29): 1D time series analysis
hw8 due Mar 23, hw9 due Mar 30
numpy.datetime, pandas, indexing, averaging, and spectra.

Week 10-12 (Apr 3/5/10/12): 2D analysis and geospatial plotting
hw10 due Apr 6, hw11 due Apr 13
Cartopy mapping package, map projections using the proj3 library, gridding irregular data, and calculating attributes of polygons using shapely. NetCDF: reading and writing NetCDF files locally and over the internet, xarray.

Week 13 (Apr 17/19): Python beyond the notebook
- Anaconda package installer; iPython for terminal window usage; writing scripts
- Working with large code bases: pdb debugger, unit testing, creating packages, documentation, pep8

Week 14 (Apr 24/26): Group project presentations. *No final.*
hw12/project due Apr 26 (undergrads)
Graduate students present, undergraduates and graduates give feedback. Attendance is required.

Optional topics (given class time and interest):
- Webscraping: automatically download data files from the internet
- Statistical methods and plotting
- Working with images: importing and exporting images, getting data out of images
- Image processing: image smoothing, finding gradients, feature recognition
- Machine learning (Scikit learn): regression and characterization

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.