TEXAS A&M UNIVERSITY

SYLLABUS

Course title and number	469/669
Term	Fall 2016
Meeting times and location	O&M 602 (College Station)/Room 330, OCSB 3029 building (Galveston) TR 9:35 – 10:50 am

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, version control systems, and the model-view-controller paradigm; plotting geophysical data using various projections, best practices in plotting, and interactive plotting.
Prerequisites: None, but previous programming experience will be very helpful.
This class is being offered in person in College Station and over Blackboard Collaborate 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 other week, and participation is integral to the class and is graded accordingly. There will be a final project and presentation for the graduate students. The grading scale is 90-100% = A, 80-89% = B, 70-79% = C, etc.
For grad students, homework will account for 50% of the grade, class participation 25%, and the final project 25%. For undergrad students, homework will account for 60% of the grade, class participation 20%, and final project feedback and participation 20%.
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 by the end of the date it is due (that is, before midnight).

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)

Week 1-3 (Aug 30, Sep [1]/6/8/13/15): Course intro; Python basics — Core language
Homework 0 due Sep 1, homework 1 due Sep 20
Using the terminal window, iPython, and Jupyter notebooks. Using version control and using git and github to manage code (and submit homework). 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 3-4 (Sep 15/20/22): Numerical python
Homework 2 due Sep 29
Numpy and scipy packages, vector operations, data types, and array broadcasting.

Week 4-5 (Sep 27/29, Oct 4): Basic plotting in python with matplotlib
Homework 3 due Oct 6, Homework 4 due Oct 13
Overview of the matplotlib plotting package.

Week 6 (Oct 4/6): 1D time series analysis
Homework 5 due Oct 20
numpy.datetime, pandas, indexing, averaging, and spectra.

Week 7 (Oct 11/13): No class (conference travel)

Week 8-10 (Oct 18/20/25/27, Nov 1): 2D analysis and geospatial plotting
Homework 6 due Oct 27, Homework 7 due Nov 3, Email project/hw8 plan by Nov 8
Basemap 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 10-12 (Nov 1/3/8/10/15): Webscraping; Image processing and analysis; Machine learning
- Webscraping: automatically download data files from the internet
- Working with images: importing and exporting images, getting data out of images
- Image processing: image smoothing, finding gradients, feature recognition
- Scikit learn: regression and characterization

Nov 17: No class (conference travel)

Week 13 (Nov 22, *no class 11/24 for Thanksgiving*, Nov 29): Python beyond the notebook
Homework 8 due Dec 1 (undergrads)
- 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 (Dec 1/6): Group project presentations. *No final.*
Graduate students present, undergraduates and graduates give feedback.

Attendance and Make-up Policies

Attendance is mandatory. If you will miss class, be sure to contact me ahead of time. Excused absences will be based on Student Rule 7 (http://student-rules.tamu.edu/rule07). Make-ups will be allowed for excused absences. No make-ups will be allowed for unexcused absences.

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.