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TEXAS A&M UNIVERSITY

SYLLABUS

Course title and number	489/689
Term	Spring 2016
Meeting times and location	O&M 617 TR 3:55 – 5:10 pm

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

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.

Co-instructor Information

Name	Robert Hetland	Kristen Thyng
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Office location	O&M 618D	O&M 608
Office hours	By appointment	By appointment

Textbook and/or Resource Material

Online course materials: https://github.com/hetland/python4geosciences.
Google group and Google calendar: https://groups.google.com/forum/#!forum/python4geosciences2016

Grading Policies

Homework will be assigned approximately every week. Students will be expected to bring unique problems to the class, so that the homework can involve real applications. There will be no exams. There will be a final project for the graduate students. The grading scale is 90-100% = A, 80-89% = B, 70-79% = C, etc.
Grad students: Homework will account for 50% of the grade, class participation 25%, and the final project 25%.
Undergrad students: Homework will account for 70% of the grade and class participation 30%.

Course Topics, Calendar of Activities, Major Assignment Dates

Week 1-2: Python basics — Core language

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: Numerical python

Numpy and scipy packages, vector operations, data types, and array broadcasting.

Week 4: Basic plotting in python with matplotlib

Overview of the matplotlib plotting package.

Week 5-6: 2D analysis and geospatial plotting

Basemap package, map projections using the proj3 library, gridding irregular data, and calculating attributes of polygons using shapely.

Week 7-8: 1D time series analysis

numpy.datetime, pandas, indexing, averaging, and spectra.

Week 9-12: Examples

- Working with large code bases: pdb debugger, unit testing, creating packages, documentation, pep8
- NetCDF: reading and writing NetCDF files locally and over the internet
- Scikit learn: regression and characterization
- Working with images: importing and exporting images, getting data out of images
- Image processing: image smoothing, finding gradients, feature recognition
- Webscaping: automatically download data files from the internet

Week 13-14: Group project presentations.

Attendance and Make-up Policies

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.

Academic Integrity

For additional information please visit: http://aggiehonor.tamu.edu

"An Aggie does not lie, cheat, or steal, or tolerate those who do."