

## Course information and learning outcomes

- ERS 420, Computer Scripting for Data Analysis, 3 credit hours
- Computer Scripting for Data Analysis provides an introduction to computer programming using python, a scripting language with numerical facilities. This scripting language will be applied to data analysis and simple computer modeling emphasizing the analysis of earth and environmental data and simulation of related processes. The course will frequently digress into discussion of mathematical concepts ranging from trigonometry to calculus, to review the mathematics underlying computational methods
- Skills that will be developed through this course focus on improved quantitative abilities and the introduction to computer programming as a tool to solve earth science problems. Students will also learn how to process and display data, improving data analysis and graphing abilities. Finally, students will convert ideas into mathematical expression, improving conceptualization skills.
- Prerequisites: Mat 126

## Contact information

- Andrew Reeve, 220 BGSC, 581-2353, asreeve@maine.edu
- Lectures: 1:00-1:50 MWF (100 BGSC)
- Office Hours: MF 12:00-1:00

## Readings

- Textbooks**
- 'A Byte of Python's' ([www.swaroopch.com](http://www.swaroopch.com))
  - 'Think Python 2e' ([www.greenteapress.com](http://www.greenteapress.com))
  - Haenel, Gouillart, and Varoquaux. 2012, Python Scientific Lecture Notes (available at [scipy-lectures.github.com](http://scipy-lectures.github.com))

**Articles** Computational geology series by H.L. Vacher published in Journal of Geoscience Education. Articles can be downloaded at <http://nagt.org/nagt/jge/columns/compgeo.html>.

More [Python tutorials]. A variety of on-line resources are available that aid in learning python.(eg. [www.python.org/doc/](http://www.python.org/doc/)).

## Required Software

Homework assignments in this class will require the use of the Python and several libraries. All the python tools are freely available and can be downloaded from various internet sites.

- The python language website is [www.python.org](http://www.python.org). Python software for a variety of computer platforms can be found at [www.python.org/download/](http://www.python.org/download/). Note that there are two versions of python (2.7.x and 3.6.x) and there are some significant differences between these versions. We will use only version 3.6.x.
- Numpy is a library for matrix manipulation that can be downloaded from <http://numpy.scipy.org/> (see link at bottom of web page).
- Matplotlib ([matplotlib.sourceforge.net/](http://matplotlib.sourceforge.net/)) is a plotting package that will be used to display data.
- Ipython and Jupyter are console/notebook interfaces that are useful for working with python ([ipython.org](http://ipython.org))
- Finally, a good text editor is needed when preparing programming files. A list of files text editors that support python can be found at [wiki.python.org/moin/PythonEditors](http://wiki.python.org/moin/PythonEditors). I like 'emacs', but also suggest 'scite' and 'geany' as they are easier to install and use. There are also several tools that integrate an editor with additional tools (integrated development environment) such as idle and spyder, that come with some of the distributions listed below.
- Large monolithic packages are available that include most of this in one package. Enthought (Canopy), Continuum Analytics (Anaconda), pyzo and python(x,y) distribute versions that can be downloaded and installed for non-commercial use. I suggest using Anaconda if you are using a Windows or Apple machine. Linux users should be able to use a package manager to install all the packages easily.

## Grading

Grading will be based on weekly to bi-weekly problem sets, two exams

- Midterm, 15%
- Final, 15% (Dec. 11, 2017; 2:45)
- Problem Sets, 70% of grade, weekly to biweekly

## Classroom Policies

**Attendance** Students are expected to attend and participate in class and are responsible for all information presented in class. There will be no grade assigned for classroom attendance or for classroom participation. Students who consistently come to class late (more than 3 minutes) and disrupt the class will have one point subtracted from the next problem set (after the fourth occurrence) for each classroom disruption.

**Missed Exams** Students unable to attend an exam must notify the instructor and make alternative arrangements **before** the exam. Only in exceptional circumstances will students be allowed to miss an exam and take it at a later date outside of the scheduled class period.

## Miscellaneous

**Academic Honesty Statement** Academic honesty is very important. It is dishonest to cheat on exams, to copy term papers, to submit papers written by another person, to fake experimental results, or to copy or reword parts of books or articles into your own papers without appropriately citing the source. Students committing or aiding in any of these violations may be given failing grades for an assignment or for an entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University.

**Course Schedule Disclaimer** In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

**Special Accommodations** If you have a disability for which you may be requesting an accommodation, please contact Student Accessibility Services, 121 East Annex, 581-2319, as early as possible in the term. Students who have already been approved for accommodations by SAS and have a current accommodation letter should privately meet with the course instructor as soon as possible.

**Sexual Discrimination Reporting** The University of Maine is committed to making campus a safe place for students. Because of this commitment, if you tell a teacher about an experience of sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct or any form of gender discrimination involving members of the campus, your teacher is required to report this information to the campus Office of Sexual Assault & Violence Prevention or the Office of Equal Opportunity.

If you want to talk in confidence to someone about an experience of sexual discrimination, please contact these resources:

- For confidential resources on campus: Counseling Center: 207-581-1392 or Cutler Health Center: at 207-581-4000.
- For confidential resources off campus: Rape Response Services: 1-800-310-0000 or Spruce Run: 1-800-863-9909.
- Other resources: The resources listed below can offer support but may have to report the incident to others who can help: For support services on campus: Office of Sexual Assault & Violence Prevention: 207-581-1406, Office of Community Standards: 207-581-1409, University of Maine Police: 207-581-4040 or 911. Or see the OSASP website for a complete list of services at <http://www.umaine.edu/osavp/>

## Course Schedule

Mon Aug 28	Introduction and Installation and the python shell	Byte:2,3
Wed Aug 30	The python shell, ipython, jupyter, and text editors	Byte:4+Think:1
Fri Sep 1	Review/Examples/Problem Set	
Mon Sep 4	NO CLASS:Labor Day	
Wed Sep 6	Variables, data types and basic operations	Byte:5,6+Think:2
Fri Sep 8	Programming logic	Byte:7+Think:5
Mon Sep 11	Programming repetition	Byte:7,16.5+Think:7,19.2
Wed Sep 13	Writing Functions	Byte:8,16.4+Think:3
Fri Sep 15	Review/Examples/Problem Set	
Mon Sep 18	Importing math (and other) libraries	Think:3
Wed Sep 20	Modules	Byte:8+Think:3
Fri Sep 22	Review/Examples/Problem Set	
Mon Sep 25	Containers for storing info	Byte:10+Think:10
Wed Sep 27	Containers for storing info	Byte:10+Think:11
Fri Sep 29	Review/Examples/Problem Set	
Mon Oct 2	Containers for storing info	Byte:10+Think:12
Wed Oct 4	Trig and algebra review	
Fri Oct 6	Review/Examples/Problem Set	
Mon Oct 9	NO CLASS:Fall Break	
Wed Oct 11	Reading and writing text files	Byte:13 Think 14
Fri Oct 13	Libraries for storing data	
Mon Oct 16	Exceptions	Byte:14 +Think:A
Wed Oct 18	Debugging methods	Byte:15.2 Scinotes:2.3
Fri Oct 20	Review/Examples/Problem Set	
Mon Oct 23	Plotting 1	Scinotes:1.4
Wed Oct 25	Plotting 2	
Fri Oct 27	Review/Examples/Problem Set	
Mon Oct 30	Numpy Arrays and fast math	Scinotes:1.3
Wed Nov 1	Numpy for solving equations	
Fri Nov 3	Review/Examples/Problem Set	
Mon Nov 6	Object Oriented Programming	Byte:12+Think:15
Wed Nov 8	TEST 1	
Fri Nov 10	Object Oriented Programming	Think:16,17
Mon Nov 13	Pandas dataframes	Scinotes:3.1
Wed Nov 15	Working with data in Pandas	
Fri Nov 17	Review/Examples/Problem Set	
Mon Nov 20	Working with data in Pandas	
Wed Nov 22	Scipy: Interpolation	Scinotes
Fri Nov 24	Review/Examples/Problem Set	
Mon Nov 27	Solving ODEs numerically	
Wed Nov 29	Scipy: Integration and ODEs	
Fri Dec 1	Review/Examples/Problem Set	
Mon Dec 4	Finite difference methods	
Wed Dec 6	Solving PDEs with FDM	
Fri Dec 8	Review/Examples/Problem Set	