

## CS 4630: PYTHON FOR COMPUTATIONAL AND DATA SCIENCES

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<i>Semester Hours:</i>	3.0	<i>Contact Hours:</i> 3
<i>Coordinator:</i>	Ray Kresman	
<i>Text:</i>	Various	
<i>Author(s):</i>	VARIOUS	
<i>Year:</i>	Various	

### SPECIFIC COURSE INFORMATION

#### *Catalog Description:*

Accelerated introduction to Python. Sample problems in STEM domains and computational approaches to solving them. Generic, and domain-specific libraries and tools. Introduction to data variety, analysis, and visualization. Prerequisite: MATH 1310 and C or better in CS 1010 or CS 2010 or consent of instructor. Cannot earn credit for both CS 4630 and CS 5630.

Course type: **ELECTIVE**

### SPECIFIC COURSE GOALS

- I can use language libraries to solve basic computational problems in STEM domain [examples: a) sequence alignment and use of STEM datasets; b) scripting in STEM applications; c) hypothesis testing and optimization].
- I can explain language mechanisms for handling missing data, and cite sample STEM applications where missing data is prevalent.
- I can use basic visualization and data classification on STEM datasets.
- I can explain certain data formats in STEM fields.
- I can use the primitives in certain libraries, for example: Numpy, Scipy, BiopythonSympy, Pyomo, Mathplotlib, Pandas.

### LIST OF TOPICS COVERED

- Accelerated introduction to Python (~ 15%)
- Datasets in the sciences (~ 10%)
  - Data formats in STEM fields, examples: atmospheric science, biology

- Missing data - for example, radar measurements
  - Data wrangling and analysis
- Applications - Math & Physics (~ 15%)
  - Matrix operations & ODE
  - Projectile motion and simple harmonic motion
  - Optimization
- Applications - Geology/Hydrology/GIS (~ 15%)
  - Raster & vector data
  - Line and contour plots
  - Basics of filtering and noise reduction
  - Process map layers and time series data
- Applications - Psychology and Statistics (~ 15%)
  - Descriptive and inferential statistics,
  - Models & hypothesis
  - Significance and hypothesis testing
- Applications - Chemistry/Biology/CS (~ 25%)
  - Chemical equations, stoichiometry
  - Bioinformatics and sequence alignment
  - Dynamic programming
  - Data and spatial visualization
  - Data science programming