ATMS 235 - Fall 2024

Python for Atmospheric Scientists

Evan Couzo, PhD
ecouzo@unca.edu
256C Rhoades Robinson Hall
Office Hours: M – 2:00 to 3:00 and T 11:00 – 12:00
828.251.6026 (but I don't answer)

Course Description: An introduction to coding and data analysis in Python with an emphasis on meteorological and environmental applications. Topics covered may include data types, programming logic, loops, and conditional statements. No prior coding experience is expected or required.

Credit Hours: 3

Class Meetings: MW – 12:30 to 1:45 p.m. – 238 Rhoades Robinson Hall

Online Course Site: classroom.google.com, Class Code: pkvgu6m

Suggested Texts: Textbooks are not required for this course, but I will post links to readings in the Course Calendar section of the syllabus. Here is a list of resources you may want to consult throughout the semester (and your career!).

1. Official Python 3 documentation: `https://docs.python.org/3/`

2. H. Fangohr (2022). *Introduction to Python for Computational Science and Engineering.* `https://fangohr.github.io/introduction-to-python-for-computational-science-and-engineering/book.pdf`

3. ChatGPT: `https://chat.openai.com/` (more on this below)

Student Learning Outcomes

1. Learn to execute Python code interactively and from scripts

2. Gain fluency with built-in Python data types and common scientific packages

3. Analyze real-world data sets using Python

Assignments (100 points total)

1. <u>Problem Sets (40 points)</u>: You will have several assignments to help build fluency with coding skills and concepts. Each will vary in complexity; some will be basic practice while others will have more moving parts. You are encouraged to work together, but I expect the work you turn in to be your own and represent your true understanding of the material.

   Due dates are listed in the Course Calendar section of this syllabus. I am generally flexible and understanding with extensions **if** you ask me ahead of time. (Note that requesting an extension is no guarantee that I will grant one, however.) Late assignments without an extension that are turned in by the next class meeting may be penalized 50%; and assignments turned in past the next class meeting may not be accepted at all.

2. <u>Data analysis project (20 points)</u>: You will use your coding skills to analyze a large data set of measurements. This project will help you integrate several concepts in an authentic scientific analysis.

3. <u>In-class presentations (10 points)</u>: You will present Python skills and/or concepts to your classmates in a series of short in-class presentations. These presentations will help you experiment with different Python methods/functions and learn navigate the built-in and online help documentation. Details will be given in class.

4. <u>Exams (30 points)</u>: You will have one midterm and one final exam, each worth 15 points. Good news - all exams are open notes, including the internet! Your future advisor/boss/client is primarily interested in whether you can complete a particular project, not whether you have all of the analysis tools memorized. The exams are timed, however, so the more you practice and ask questions, the more likely you will complete the exam in the allotted time (just like real life!).

Grading Policy

```
            B+ 88-89   C+ 78-79   D+ 68-69   F <60
   A  92-100 B  82-87   C  72-77   D  62-67
   A- 90-91  B- 80-81   C- 70-71   D- 60-61
```

Expectations

1. <u>Attendance</u>: Active engagement during class is critical to your success, and preparation for class is essential to your ability to be fully engaged. Each unexcused absence may deduct points (two points per absence) from your final grade. Note that I determine whether to excuse an absence – telling me ahead of time is not a guarantee that your absence will be excused, but I do understand the competing demands on your time. I don't mean this to be punitive; rather, this policy is meant to encourage you to learn time management and prioritize class attendance.

I expect you to bring your laptops and chargers to class with you. Nearly all of our in-class work will be computer-based, and you must have a working python environment to participate fully. You will mainly be working in an interactive python environment (called a Jupyter notebook) that allows you to take notes and write explanations to yourself as you are writing and executing snippets of code. I also recommend taking some notes by hand.

2. <u>Ask Questions:</u> Learning a language is frustrating. You may feel lost without being able to articulate your confusion. Embrace the struggle! Learn to use specific language (e.g. "Why am I getting a SyntaxError?" instead of "Why isn't this working?"). Experiment to see how commands work. And, most importantly, don't give up! You *can* learn Python, but don't expect it to always be easy.

3. <u>ChatGPT:</u> Volumes have been written about the potential dangers and benefits of ChatGPT and other large language model-based chatbots. I've found ChatGPT to be a useful tool for helping me code. While the usual caveats apply (e.g. don't trust it 100%), you might find "conversations" with the bot help you reach a greater understanding of Python. I encourage you to use ChatGPT *responsibly*. That is, use it as a personalized tutor that helps you code, but don't rely on it do to the work for you. Sign up for an account at https://chatgpt.com.

Course Calendar

Week 1
| Aug 19 | first day stuff |
| Aug 21 | Anaconda installation and set up |

Week 2
| Aug 26 | strings |
| Aug 28 | strings |

Week 3
| Sep 2 | NO CLASS - Labor Day |
| Sep 4 | for loops lab (sections 1 and 2) |

Week 4
| Sep 9 | Problem Set 1 workday | |
| Sep 11 | lists | **Problem Set 1** |

Week 5
| Sep 16 | lists |
| Sep 18 | for loops lab (sections 3 and 4) |

Week 6

Sep 23	Problem Set 2 workday	
Sep 25	numpy arrays	**Problem Set 2**

Week 7

Sep 30	numpy arrays
Oct 2	numpy arrays

Week 8

Oct 7	NO CLASS - Fall Break
Oct 9	conditional statements lab

Week 9

Oct 14	Problem Set 3 workday	
Oct 16	midterm	**Problem Set 3**

Week 10

Oct 21	user-defined functions
Oct 23	Linux filepaths lab

Week 11

Oct 28	Problem Set 4 workday	
Oct 30	TBD	**Problem Set 4**

Week 12

Nov 4	pandas DataFrames
Nov 6	pandas DataFrames

Week 13

Nov 11	data analysis project
Nov 13	data analysis project

Week 14

Nov 18	netCDF (xarray)	
Nov 20	netCDF (xarray)	**data analysis project**

Week 15

Nov 25	TBD

| Nov 27 | NO CLASS - Thanksgiving |

Week 16
| Dec 2 | metpy |

| Final Exam | **Monday, Dec 9, 11:30-2:00** |

Accommodations for Students with Disabilities: University of North Carolina at Asheville is committed to making courses, programs and activities accessible to persons with documented disabilities. Students requesting accommodations and/or academic adjustments must do so through the Office of Academic Accessibility and may be required to provide supporting documentation. All information provided will remain confidential. For more information please contact the Office of Academic Accessibility at 828.232.5050 or academicaccess@unca.edu, visit them in the OneStop Student Services Center or at their website https://oaa.unca.edu/.

University Academic Policies and Procedures: Students are expected to abide by UNC Asheville academic policies and procedures, especially those regarding academic honesty and in-class behavior. They can be summarized as *don't cheat* and *come ready to learn*. See http://catalog.unca.edu/ for the exact wording of the policy.

Promoting Gender Equity, Addressing Sexual Misconduct: UNC Asheville is dedicated to cultivating and maintaining a safe, respectful, and inclusive environment, free from harassment and discrimination. We strive to ensure that all have equal access to the educational and employment opportunities the University provides. If you or someone you know has been affected by sexual misconduct, including sexual or gender-based harassment, sexual assault, dating or domestic violence, or stalking, please know that help and support are available. UNC Asheville strongly encourages all members of the community to take action, seek support, and report incidents of sexual harassment to the Title IX Office. You may contact the Title IX Office or Heather Lindkvist, the Title IX Coordinator, directly at 828.232.5658 or at titleix@unca.edu. Learn more by visiting https://titleix.unca.edu.

As a faculty member, I am a "responsible employee" and private resource. This means that if you share any information or discuss an incident with me regarding sexual or gender-based harassment, I must disclose this information to the Title IX Coordinator. Our goal is to ensure you are aware of the range of options available to you and have access to the resources you may need.

If you wish to speak with a confidential resource, contact University Health and Counseling Services at 828.251.6520. Off-campus confidential resources include Our Voice (24-Hour Hotline at 828.255.7576) and HelpMate (24-Hour Hotline at 828.254.0516).