

# **GEOG 4560 Section 001 - Introduction to Python Programming (Spring 2023)**

Class Location and Time: ENV 336, Mon & Wed 12:30 pm - 1:50 pm

Meeting Dates: 1/17/2023 - 5/12/2023

## **Instructor Information**

Dr. Wei Kang (She/Her)

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Teaching Assistant: Prashant Thapaliya, E-mail: [prashantthapaliya@my.unt.edu](mailto:prashantthapaliya@my.unt.edu)

Office: ENV 379

Office Hours: Tue & Thur 11:00 AM – 12:30 PM, or by appointment.

## **Course Description**

Computational skills of practitioners are in increasing demand in contemporary research in analytical geography. Advances in spatial data analysis have also largely outpaced the capabilities of standard statistical software. At the same time, the multidisciplinary nature of the spatial sciences often translates into the need to deal with disparate data sources, formats, and programming languages. As such, students undertaking research are often confronted with a daunting set of tasks that are seldom covered in an integrated fashion in course work. This course is designed to address this situation. It introduces geography students to basic computational concepts using Python, an object-oriented scripting language, for data processing, analysis, and application development in geographic research. It is aimed at providing students with skill sets that are in high demand within academic GIScience and commercial GIS development.

## **Course Objectives**

Upon successful completion of this course, students will be able to:

- Master the fundamentals of writing Python scripts.
- Write Python functions to facilitate code reuse.
- Make their code robust by handling errors and exceptions properly.
- Develop python programs for data manipulation.
- Create python programs for solving problems.

## **Prerequisites**

No prior programming experience is required.

## **Software**

Python 3, Anaconda 3, Jupyter Notebook/Lab, Git/GitHub, Visual Studio Code

We will cover the installation of these packages/software early in the semester and you are **strongly encouraged to bring your own laptop to class** so that you may work with these packages outside of the classroom availability. We will use Jupyter Notebook to interact with Python 3, including class lectures and assignments. We will introduce Jupyter Notebook at the beginning of the course.

## Required/Recommended Materials

Downey, A.B. (2015) Think Python: How to Think Like a Computer Scientist. 2<sup>nd</sup> Edition. Green Tea Press, Needham, Massachusetts. Downloadable for free as [a pdf file](#).

We will also read some online materials for some of the weeks. I also expect you to learn to explore the vast number of open-source materials on python whenever needed.

## Grading

Programming can be best learned through hands-on exercises. We will have (about) weekly programming assignments that will use the knowledge learned from the class. Occasionally, we will have in-class quizzes to assess your comprehension of course material and record attendance. We will also have a mid-term exam and a final exam comprised of multiple-choice and open-ended questions. Before each exam, we will have a review session.

Grading will be assigned on the following scale: A: 90-100, B: 80-89, C: 70-79, D: 60-69, E below 60. There will be no curves. Points are assigned as follows:

Component	Points
Programming Exercises	50
In-class Quizzes/labs	10
Mid-term Exam (take-home)	15
Final Exam	25
Total possible	100

### *Programming Exercises (HW)*

Each exercise contains several python programming problems and closed- or open-ended questions in the Jupyter Notebook environment. They are based on the classroom lectures and assigned readings and are to be completed on your own time outside of class. We will have 10 sets of exercises (each carrying 5 points), and you have a week to complete each. Occasionally, we will use some classroom time after the submission to discuss the solutions to the exercises.

You will use your UNT EUID and password to login the Jupyter Hub <https://jupyterhub.cas.unt.edu/> to complete the assignment and submit it. You need to make sure to connect to UNT VPN beforehand.

### *In-class Quizzes*

We will have in-class quizzes to assess your comprehension of course material and record attendance. Note that not every class will have a quiz. Instead, the quizzes will be randomly assigned to sessions. Make sure to attend the class in person to complete the quiz and gain the credit. The in-class quizzes will account for 4 points.

### *Lab*

We will have one lab which will guide you to work with Git, GitHub, and Visual Studio Code. This lab accounts for 4 points. We will have another follow-up lab to use Visual Studio Code to communicate with our course repository. This lab accounts for 3 points.

### Mid-term Exam and Final Exam

Both exams will comprise conceptual questions and programming exercises. The take-home mid-term exam will be released on Canvas on March 8 after the class, you have three attempts, and the highest score will be used toward your final grade of the course. You have until March 21 to complete the exam.

The final exam will be in closed form administered in the classroom on May 8. The types of questions will be similar to those in the mid-term exam, and we will have a review session on May 3.

### Lateness/make-up policy

Programming Exercises *are due* at **10:00 pm** on the day indicated in the course schedule (generally one week after the exercise is assigned). Late submissions **will not** be accepted.

## Course Schedule

Please note that the schedule below is indicative only and may be subject to change.

Week	Date	Topic	Reading	Assignment	Due
1	01/18	Introduction, Syllabus			
2	01/23	Installation, Jupyter Notebook, Markdown	<a href="#"><u>Jupyter Notebook Documentation</u></a>		
	01/25	Program, Variables, Operators	Chapters 1, 2		
3	01/30	Campus closed			
	02/01	Campus closed			
4	02/06	Functions (1), Jupyter Hub for Programming Assignments	Chapter 3	HW1 (5%)	02/14
	02/08	Scalar types	Chapter 5		
5	02/13	GitHub & Git (1)	<a href="#"><u>Git Tutorial</u></a>	Lab (4%): GitHub & Git	02/16
	02/15	GitHub & Git (2)		Lab (2%): Collaborate on GitHub projects	02/21
6	02/20	Q&A on programming exercises			
	02/22	Conditionals, Strings (1)	Chapter 8	HW2 (5%)	02/28
7	02/27	Strings (2), Iterations	Chapter 7		
	03/01	Strings (3)	Chapter 9	HW3 (5%)	03/07
8	03/06	Strings (4), Lists (1)	Chapter 10		
	03/08	Lists (2), Tuples	Chapter 12	HW4 (5%), Take away Mid-term Exam (15%)	03/21
9	03/13	Spring Break – No Class			
	03/15	Spring Break – No Class			
10	03/20	Sets	Chapter 11		
	03/22	Dictionaries	Chapters 6, 7	HW5 (5%)	03/28
11	03/27	Functions (2)	Chapters 15, 16		
	03/29	Iteration (2)	Chapters 17, 18	HW6 (5%)	04/04

12	04/03	Object-oriented programming (OOP) (1)			
	04/05	Object-oriented programming (OOP) (2)	Chapter 14	HW7 (5%)	04/11
13	04/10	Object-oriented programming (OOP) (3)			
	04/12	Q&A on programming exercises			
14	04/17	Scripts and modules, Python Ecosystem		HW8 (5%)	04/23
	04/19	Scientific Computing with Numpy	<u>NumPy Tutorial</u>		
15	04/24	Plotting with Matplotlib	<u>Matplotlib Tutorial</u>	HW9 (5%)	04/30
	04/26	Handling data with Pandas (1)	<u>Pandas Tutorial</u>		
16	05/01	Handling data with Pandas (2)		HW10 (5%)	05/10
	05/03	Review for final			
17	05/08	Final Exam		Final Exam (25%)	

## How to Succeed in this Course

I value the many perspectives students bring to our campus. Please work with me to create a classroom culture of open communication, mutual respect, and inclusion. All discussions should be respectful and civil. Although disagreements and debates are encouraged, personal attacks are unacceptable. Together, we can ensure a safe and welcoming classroom for all. If you ever feel like this is not the case, please stop by my office and let me know. We are all learning together.

Every student in my class can improve by doing their own work and trying their hardest with access to appropriate resources. Students who use other people's work without citations will be violating UNT's Academic Integrity Policy. Please read and follow this important set of [guidelines](#) for your academic success. If you have questions about this, or any UNT policy, please email me or come discuss this with me during my office hours.

## Office Hours

Office hours offer you an opportunity to ask for clarification or find support with understanding class materials. Come visit me at ENV 320J or via a Zoom meeting during the office hours Mon & Wed 2:00 – 3:00 pm! (Please also do not hesitate to talk to our TA should you have any questions about course materials). I also encourage you to connect with me through emails for support. During busy times, my inbox becomes rather full, so if you contact me and do not receive a response within two business days, please send a follow-up email. A gentle nudge is always appreciated. Your success is our goal.

We will use Canvas and GitHub to distribute course materials. Some of the assignments are gathered through Canvas, while others are gathered on a server (Jupyter Hub). If you are not familiar with Canvas, or if you have any questions about using Canvas, please read the [Canvas Student Guide](#). We will introduce GitHub and Jupyter Hub in the class.

## Attendance

Research has shown that students who attend classes are more likely to be successful. You must attend every class unless you have a university excused absence such as active military service, a religious holy day, or an official university function as stated in the [Student Attendance and Authorized Absences Policy](#). If you cannot attend a class due to an emergency, please let me know. Your safety and well-being are important to me.

## UNT Policies

### Academic Integrity

According to [UNT Policy 06.003](#), Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

Specifically, all submitted work should be your own and academic dishonesty is not allowed. Academic dishonesty can be defined as:

- Copying answers
- Copying words, ideas, or other materials from another source without giving credit to the original author
- Copying from your peers within the course
- Employing or allowing another person to alter or revise your work, and then submitting the work as your own

Please don't share or reuse solutions to assignments which is an academic integrity concern. Please do not:

- Share complete assignment code
- Upload completed assignments to public websites with the goal of sharing solutions. (You can share your work and ideas for professional purposes though).
- Take a peer's solution and submit it as your own

### ADA Accommodation Statement

UNT makes reasonable academic accommodations for students with disabilities. Students seeking reasonable accommodation must first register with the [Office of Disability Access \(ODA\)](#) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to the faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time; however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the [ODA website](#).

### Acceptable Student Behavior

Students and student groups are expected to conduct themselves in a manner that demonstrates respect for the rights and property of others and upholds the integrity and values of the University community. Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and

electronic classrooms, labs, discussion groups, field trips, etc. Visit [UNT's Code of Student Conduct](#) to learn more.

### **Emergency Notification & Procedures**

UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.