

GEOG 5560 Section 002 - Application Development with Python Programming (Fall 2022 1)

Class Location and Time: ENV 340, Mon & Wed 11:00 am - 12:20 pm

Meeting Dates: 08/29/2022 - 12/14/2022

Instructor Information

Dr. Wei Kang (She/Her)

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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 research problems.

Prerequisites

No prior programming experience is required. You are **strongly encouraged** to bring your own laptop to class and to use it to enhance your understanding and engagement with python programming and various packages we will be using.

Software

Python 3, Anaconda 3, Jupyter Notebook, PyCharm

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. 2nd 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

I believe programming can be best learned through hands-on exercises. This class does not have quizzes or exams. Instead, we will have (about) weekly programming assignments that will use the knowledge learned from the class. Therefore, every student must participate in the classroom. We will have a group project which requires a pair of students to research and present an external python package of their interest. Each student is also required to independently propose and work on a programming project and present it to the class during the last week of the semester. The project proposal is due in the middle of the semester, and we will have weeks that do not have assignments so that you can work on the project.

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. I will assign +/- on an individual basis. Points are assigned as follows:

Component	Points
Homework Exercises	40
Group Project	15
Final Project Presentation	15
Final Project Report	30
Total possible	100

Homework Exercises

Each exercise contains several python programming exercises 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 4 points), and you have a week to complete each. We will use some classroom time after the submission to discuss the solutions to the exercises.

Group Project

Group Project consists of a group presentation on a python package of interest. The project will be graded by a presentation (10 mins) and peer review.

Final Project

Graduate students are required to carry out a final individual project on using python for addressing a research question. The project will be graded by a presentation (10-15 mins) and a written paper.

Lateness/make-up policy

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.

The final Project Report is due at **10:00 pm** on the last day of the class (Dec 14, 2022). Late submissions will have a penalty of **5 marks** deducted for each day late. The report will not be accepted more than one week past the due date unless there are exceptional circumstances.

Course Schedule

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

Week	Date	Topic	Recommended/Further Readings	Assignment	Due
Week 1	08/29	Introduction, Syllabus			
	08/31	Installation, Jupyter Notebook, Markdown, GitHub, Git	Jupyter Notebook Documentation	GitHub Hello World exercise (ungraded)	09/07
Week 2	09/05	Labor Day			
	09/07	Program, Variables, Operators	Chapters 1, 2, 5 (5.1, 5.2, 5.3)	H1 (4%)	09/14
Week 3	09/12	Functions (1)	Chapter 3		
	09/14	Numerical type, Strings	Chapters 8	H2 (4%)	09/21
Week 4	09/19	Lists, Tuples	Chapter 10		
	09/21	Dictionaries	Chapter 11	H3 (4%)	09/28
Week 5	09/26	Flow Control	Chapters 5, 7		
	09/28	Functions (2)	Chapter 6	H4 (4%)	10/05
Week 6	10/03	Reusing code: scripts and modules	Chapter 14		
	10/05	Python Ecosystem & Group Project Descriptions			
Week 7	10/10	Input and Output	Chapter 14	H5 (4%)	10/17
	10/12	Object-oriented programming (OOP) (1)	Chapters 15, 16		
Week 8	10/17	Object-oriented programming (OOP) (2)	Chapters 17, 18	H6 (4%)	10/26

	10/19	Group Project Presentation		Group Project Presentation (15%)	
Week 9	10/24	Numpy (1)	NumPy Tutorial		
	10/26	Numpy (1)	NumPy Tutorial	H7 (4%)	11/02
Week 10	10/31	Pandas (1)	Pandas Tutorial		
	11/02	Pandas (2)	Pandas Tutorial	H8 (4%)	11/09
Week 11	11/07	Final Project Descriptions			
	11/09	Matplotlib (1)	Matplotlib Tutorial		
Week 12	11/14	Matplotlib (2)	Matplotlib Tutorial	H9 (4%)	11/21
	11/16	Presentations of ideas for Final Project			
Week 13	11/21	Geopandas (1)	Geopandas Tutorial		
	11/23	Thanksgiving Break-No Class			
Week 14	11/28	Geopandas (2)	Geopandas Tutorial	H10 (4%)	12/05
	11/30	Work on Final Project			
Week 15	12/05	Work on Final Project			
	12/07	Final Project Presentations (1)		Final Project Presentation (15%)	
Week 16	12/12	Final Project Presentations (2)		Final Project Presentation (15%)	
	12/14	Final Project Report Submission		Report (30%)	By 10 pm

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 1:00 – 2:00 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 to distribute course materials and gather assignments. If you are not familiar with Canvas, or if you have any questions about using Canvas, please read the [Canvas Student Guide](#).

Attendance

Research has shown that students who attend classes are more likely to be successful. You should 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.