Course Information

Course Number: OCNG 469/669
Course Title: PYTHON FOR GEOSCIENCES
Section: 500/600
Time: TR 12:45 – 2:00pm
Location: OMB 602; Canvas LMS
Credit Hours: 3

Instructor Details

Instructor: Shuang Zhang
Office: Eller O&M Building Room 611
Phone: 979-845-2306
E-Mail: shuang-zhang@tamu.edu
Office Hours: By appointment (online Zoom meeting or in person)

Course Description

Core language Python programming; read and write data using standard formats, scientific programming analysis methods; analysis of Earth science data sets; visualizing Earth science data; geospatial analysis.

Course Prerequisites

None, but previous programming experience will be very helpful.

Special Course Designation

None

Course Learning Outcomes

Students will understand the basic concepts of programming. In particular, they will understand basic Python programming as typically used in the geosciences, that is, for one- and two-dimensional geospatial analysis for scientific applications.

1. Read and write data using standard formats,
2. Understand modern coding techniques including object-oriented programming,
3. Utilize modern coding environment (Jupyter notebook) to perform data analysis
4. Perform common geo-data manipulation and analysis,
5. Use best practices when visualizing data,
6. Write efficient code to handle geospatial analysis tasks,
7. Project design

Textbook and/or Resource Materials

- o Required textbook: **None**
- o Recommended textbook (available at TAMU e-library)
    - ▪ Magnus Lie Hetland, 2017, **Beginning Python**: From Novice to Professional (Third edition)
    - ▪ Robert Johansson, 2018, **Numerical Python**: Scientific Computing and Data Science Applications with Numpy, SciPy and Matplotlib (Second edition)
- o In-class laptop required

o   Materials will be published on Canvas

Grading Policy

- 70% homework, 5% participation/coding exercise, and 25% final project.
- **No bonus credits**
- Standard Letter Grading Scale:
    - A = 90-100%
    - B = 80-89.99%
    - C = 70-79.99%
    - D = 60-69.99%
    - F = <60

Homework – It will be submitted through Canvas and graded automatically when possible. This means that your code needs to run to get points — you will not receive points for code that does not run. Extra homework (in certain cases) will be assigned to **graduate students** on top of the homework assigned to undergraduate students. Homework will **normally** be **posted on Sunday or Monday and due at 11:59pm every Tuesday night**, so you have more than one whole week to work on the homework.

Final Projects – This individual project is meant to be an assignment that will test and utilize the skills taught in this course. This is also supposed to be a 'fun' project that permits you to identify a dataset of your choosing and learn something from it. Students will identify a dataset in which they have some interest (e.g., download data from remote sensing and plot maps of the various features, analyze energy consumption from different countries through time, demonstrate the distribution of significant Earthquakes on Earth surface, etc.). Each student will submit a Jupyter notebook file (as well as the dataset) containing all the code and analysis. On top of that, **graduate students** will give a short presentation to the class telling us about their project. Expected time of presentation (~8 min, subject to change).

Late Work Policy
Late homework will not be accepted unless an approved Texas A&M University excuse applies or prior arrangement has been approved. Prior arrangement constitutes approval 24-hours before assignment is due. If prior approval is granted for any reason except an approved University excuse, then a ten-percent penalty per day late will be assessed.

- Late work is accepted with a University-approved excuse.
- A penalty of 10% per day late (i.e., 0.417% per hour late), if not a University-approved excuse.
- Late work is any assignment submitted after the closing deadline.

Academic Integrity
For additional information please visit: http://aggiehonor.tamu.edu

Students are encouraged to work together both in and out of class, but absolutely need to complete their own work and understand what they turn in. "An Aggie does not lie, cheat, or steal, or tolerate those who do." Plagiarism is not the thing to do in this class.

Course Schedule

Week 1-3 (Jan 17/19, Jan 24/26, Jan 31/Feb 02) – Course intro and Python basics
Learning Jupyter notebooks. Python variables, operators, standard data containers (lists, tuples, dictionaries, etc.), basic built-in functions, for/while loops, conditional statements, user-defined functions
Hw01, Hw02, Hw03

Week 4-5 (Feb 07/09, Feb 14/16) – Numerical Python
Numpy, array operations (concatenation, stacking, etc.), universal functions, etc.
Hw04, Hw05

Week 6 (Feb 21/23) – Basic data visualization
Matplotlib, plot customization
Hw06

Week 7 (Feb 28, Mar 02) – Review and coding exercises
Review and coding exercises
Hw07

Week 8-11 (Mar 07/09, Mar 14/16 [no classes], Mar 21/23, Mar 28/30) – Pandas and advanced data visualization
DataFrame creation, indexing, grouping; time-series analysis; Seaborn visualization
Hw08, Hw09, Hw10

Week 12-14 (Apr 04/06, Apr 11/13, Apr 18/20) – Geospatial data analysis
Geographic mapping, vector and raster file read and manipulation, coding review
Hw11

Week 15 (Apr 25/27) – Project presentation
Graduate students present, undergraduates and graduates give feedback.
Final Project Presentation

University Policies

Attendance Policy

Attendance is highly recommended, and part of your grade is based on in-class participation. If you will miss class, be sure to contact me ahead of time.

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments.

Please refer to Student Rule 7 in its entirety for information about excused absences, including definitions, and related documentation and timelines.

Makeup Work Policy

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor.

Please refer to Student Rule 7 in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor" (Student Rule 7, Section 7.4.1).

"The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence" (Student Rule 7, Section 7.4.2).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See Student Rule 24.)

Academic Integrity Statement and Policy

"An Aggie does not lie, cheat or steal, or tolerate those who do."

"Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case" (Section 20.1.2.3, Student Rule 20).

Texas A&M at College Station
You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at aggiehonor.tamu.edu.

Texas A&M at Galveston
You can learn more about the Honor Council Rules and Procedures as well as your rights and responsibilities at tamug.edu/HonorSystem.

Texas A&M at Qatar
You can learn more about academic integrity and your rights and responsibilities at Texas A&M University at Qatar by visiting the Aggie Honor System website.

Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact the Disability Resources office on your campus (resources listed below) Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or

chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Texas A&M at College Station
Disability Resources is located in the Student Services Building or at (979) 845-1637 or visit disability.tamu.edu.

Texas A&M at Galveston
Disability Resources is located in the Student Services Building or at (409) 740-4587 or visit tamug.edu/counsel/Disabilities.

Texas A&M at Qatar
Disability Services is located in the Engineering Building, room 318C or at +974.4423.0316 or visit https://www.qatar.tamu.edu/students/student-affairs/disability-services.

Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see University Rule 08.01.01.M1):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, a person who is subjected to the alleged conduct will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Texas A&M at College Station
Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with Counseling and Psychological Services (CAPS).

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's Title IX webpage.

Texas A&M at Galveston

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with the Counseling Office in the Seibel Student Center, or call (409)740-4587. For additional information, visit tamug.edu/counsel.

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the Galveston Campus' Title IX webpage.

Texas A&M at Qatar
Texas A&M University at Qatar students wishing to discuss concerns in a confidential setting are encouraged to visit the Health and Wellness website for more information.

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's Title IX webpage.

Statement on Mental Health and Wellness

Texas A&M College Station
Students who need someone to talk to can contact Counseling & Psychological Services (CAPS) or call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at suicidepreventionlifeline.org.

Texas A&M at Galveston
Students who need someone to talk to can call (409) 740-4736 from 8:00 a.m. to 5:00 p.m. weekdays or visit tamug.edu/counsel for more information. For 24-hour emergency assistance during nights and weekends, contact the TAMUG Police Dept at (409) 740-4545. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at suicidepreventionlifeline.org.

Texas A&M at Qatar
Texas A&M University at Qatar students wishing to discuss concerns in a confidential setting are encouraged to visit the Health and Wellness website for more information.

Campus-Specific Policies

Texas A&M at Galveston
Classroom Access and Inclusion Statement

Texas A&M University is committed to engaged student participation in all of its programs and courses and provides an accessible academic environment for all students. This means that our classrooms, our virtual spaces, our practices and our interactions are as inclusive as possible and we work to provide a welcoming instructional climate and equal learning opportunities for everyone. If you have an instructional need, please notify me as soon as possible.

The Aggie Core values of respect, excellence, leadership, loyalty, integrity and selfless service in addition to civility, and the ability to listen and to observe others are the foundation of a welcoming instructional climate. Active, thoughtful and respectful participation in all aspects of the course supports a more inclusive classroom environment as well as [our](our) mutual responsibilities to the campus community.