Course Syllabus, Spring 2023, 3 Credits

Instructor: Dr. Edward Oughton

Email: eoughton@gmu.edu

Location: 2310 Exploratory Hall (in-person)

When: Monday 16:30 – 19.10 hrs

TA: N/A

Pre-requisites: NA, although prior programing experience is preferred.

Contact method: Blackboard discussion board for content related queries (preferred) or direct email for anything that relates to your own personal circumstances (eoughton@gmu.edu).

OVERVIEW & OBJECTIVES

This course teaches participants how to undertake Python-based data analysis, modeling, simulation, and visualization of high-resolution spatial data at the planetary scale. An examination of the most prestigious scientific journals demonstrates many examples of global assessments relating to deforestation, climate change, natural hazards, and many other topics. Indeed, graduate students able to undertake systematic assessment of the whole globe for their chosen area of study have a strong foundation for developing new scientific discoveries, informing decisions in industry and government, and publishing their work in high-impact scientific journals. Therefore, this course has three main learning outcomes. Firstly, developing global geospatial data analytics in Python to support decisions in industry and government. Secondly, gaining a proficient ability to work with high-resolution local data (e.g., 1 km^2) but at the global scale. Finally, running basic parallel computing scripts, both on a single machine and on a High-Performance Computing (HPC) cluster.

LEARNING OUTCOMES

1. Developing global geospatial data analytics in Python to support decisions in industry and government.
2. Gaining a proficient ability to work with high-resolution local data (e.g., 1 km^2) but at the global scale.
3. Running basic parallel computing scripts, both on a single machine and on a High-Performance Computing (HPC) cluster.

GGS COMPUTER LAB, ASSIGNMENTS, & EXPECTATIONS

Students have remote access to the GGS Virtual Computing Lab with the software required for this course. However, as the software is open source you are encouraged (where possible) to download a version on your own machine.

All materials will be distributed in the Jupyter Notebook format, providing all information and code in single location for you. You can also add your own notes to these notebooks. This is superior to having to deal with separate files for presentations, code, and notes in different formats.

Assignments will be based on the lecture material you receive and will be administered via Blackboard. Generally, assignments will be set on a Monday and will be due the following week prior to the start of the lecture (except when noted in the Course Schedule). Late work will be penalized 20% for each day late. Late submissions will only go unpenalized for documented medical reasons or by previous agreement with the instructor. Grading will be as follows:

GRADING		
Assessment	**Points**	**%** (of final grade)
Assignments/tests (8)	100	75%
Coursework project	100	25%

Grades will be based on the following cutoff values, although the instructor reserves the right to alter the values at the end of the course:

A (93%), A- (90%), B+ (87%), B (83%), B- (80%), C+ (77%), C (73%), C- (70%), D (60%)

The coursework project will include the use of processing techniques taught throughout the entire semester but applied to your own research topic. Students will be expected to submit assignments online through Blackboard. Only Word document (.docx or .doc) or Adobe PDF (.pdf) file formats will be accepted. Generally, to avoid formatting changes, it is advised to save word documents as the .pdf format prior to submission.

OPTIONAL TEXTS

There are many open and free resources for using Python. Importantly, all the information you require will be provided in the course. However, should you require additional information, for example relating to programming languages, there are many options. Check out Al Sweigart's Automate the Boring Stuff with Python which is free to read and provides practical programming for total beginners. Further readings, if any, will be announced in class or by e-mail.

COURSE RESOURCES

Content will be available on Blackboard, otherwise known as myMason. All materials will also be place on the code repository website GitHub. You will need to have access to a computer with a stable Internet connection capable. It may also be useful to have a web camera with a microphone in case any additional Zoom sessions are required.

OFFICE HOURS AND INSTRUCTOR INTERACTION

Office hours will be held on Mondays from 15.30 – 16.30 hrs. Each student is expected to attend office hours at least once per semester. When emailing, a timely response is expected during office hours Monday-Friday. If you have a course-related question, the first port of call will be to place it on the Blackboard discussion board. This is because other people may ask similar questions, so this becomes a shared knowledge base everyone can access. If you need to speak about something more personal with the instructor, then you can reach out via email. Succinct emails are likely to increase the efficiency of an answer.

ACADEMIC INTEGRITY

GMU has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to always follow are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged, with the expectation that all aspects of the class will be conducted with civility and tolerance for differing ideas, perspectives, and traditions.

GMU EMAIL ACCOUNTS

Students must use their MasonLive email account to receive important University information, including messages related to this class. See http://masonlive.gmu.edu for more information. Please do not email the instructor from a non-GMU email account.

DIVERSITY

GMU promotes a living and learning environment for outstanding growth and productivity among its students, faculty, and staff. Through its curriculum, programs, policies, procedures, services, and resources, Mason strives to maintain a quality environment for work, study, and personal growth.

An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also entails different viewpoints,

philosophies, and perspectives. Attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds, and practices can be voiced, heard, and respected.

The reflection of Mason's commitment to diversity and inclusion goes beyond policies and procedures to focus on behavior at the individual, group, and organizational level. The implementation of this commitment to diversity and inclusion is found in all settings, including individual work units and groups, student organizations and groups, and classroom settings; it is also found with the delivery of services and activities, including, but not limited to, curriculum, teaching, events, advising, research, service, and community outreach.

Acknowledging that the attainment of diversity and inclusion are dynamic and continuous processes, Mason seeks to continuously improve its environment. To this end, the University promotes continuous monitoring and self-assessment regarding diversity. The aim is to incorporate diversity and inclusion within the philosophies and actions of the individual, group, and organization, and to make improvements as needed.

In this regard, should you have any comments or feedback that you wish to raise, please do let the instructor know as your feedback is incredibly valuable.

OFFICE OF DISABILITY SERVICES

If you are a student with a disability and you need academic accommodations, please contact the instructor and the Office of Disability Services (ODS) at 993-2474, http://ods.gmu.edu. All academic accommodations must be arranged through the ODS.

STUDENTS AS SCHOLARS

Students as Scholars is GMU's award-winning initiative to give students the opportunity to conduct undergraduate research. If you are interested in conducting research or simply learning more about the program, check out oscar.gmu.edu or stop by the Office of Student Scholarship, Creative Activities, and Research to learn about the many programs available to GMU students.

GMU RESOURCES

The Writing Center: https://writingcenter.gmu.edu

University Libraries, Ask a Librarian: https://library.gmu.edu/ask

Counseling and Psychological Services: https://caps.gmu.edu

University Catalog: https://catalog.gmu.edu

University Policies: https://universitypolicy.gmu.edu

COURSE OUTLINE

Week	Topic	Coursework
Week 1: **Jan 23rd**	Introduction and course overview Installing Anaconda + Jupyter notebooks	Assignment 1
Week 2: **Jan 30th**	Python for total beginners	Test 1
Week 3: **Feb 6th**	Introduction to global government administrative boundary data.	Assignment 2
Week 4: **Feb 13th**	Introduction to global population density data (part 1).	-
Week 5: **Feb 20st**	Introduction to global population density data (part 2).	Assignment 3
Week 6: **Feb 27th**	Introduction to global coastal flooding data (part 1).	-
Week 7: **Mar 6th**	Introduction to global coastal flooding data (part 2).	Assignment 4
Spring Recess		
Week 8: **Mar 20th**	Introduction to global riverine flooding data (part 1).	-
Week 9: **Mar 27th**	Introduction to global riverine flooding data (part 2).	Assignment 5
Week 10: **Apr 3rd**	Introduction to global tropical cyclone flooding data (part 1).	-
Week 11: **April 10th**	Introduction to global tropical cyclone flooding data (part 2).	Assignment 6
Week 12: **Apr 17th**	Introduction to the research project	Assignment 7
Week 13: **Apr 24th**	Supported research project practical time	Coursework project
Week 14: **May 1st**	Supported research project practical time	Coursework project
Finals: **May 8th**	Coursework submission	Coursework project

Note: The course schedule is tentative and is subject to revision by the instructor