Geography 441   GIS Programming & Customization   Fall, 2020

Instructor: Dr. Keith Rice

Class Assistance: only by appointment (use e-mail for scheduling)

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This course is an introduction to programming techniques and script customization within a GIS environment. The class is divided into two parts, in the first half you will develop programming proficiencies in a common scripting computer language (Python). Basic concepts in structured programming will be introduced along with fundamental techniques (e.g. sequence, decision structures, loops). Python principles and concepts will be defined and illustrated along with a broad overview of Python script components and applicable syntax tools (e.g. IDLE). The second half of the course will focus on how a scripting language can be used within the ArcGIS geoprocessing environment. The goal is to customize GIS software routines for extended functionality and utility of the import, query, and display of geospatial information. You will learn how to create a geoprocessing tool within ArcGIS and ArcGIS Pro, and set up required parameters and environmental settings. A thorough discussion of geometric objects and their associated properties will laid the foundation for the development and implementation of Python scripts within ArcGIS. Examination of Python debugging, error checking, editing environments, dialog windows and script documentation will also be explored.

Lectures: Lecture sessions will be on Tuesday and Thursday mornings and will concentrate on the conceptualization of small to medium-sized programming scripts and their associated syntax and applications to GIS problems. These topics will lay the foundation for both interactive assignments and programming exercises.

Laboratory: All labs will be conducted in an online environment. You will need to use the desktop computers in B-308 in-person or online through UWSP's Online Access Lab system. In the Online Access system you will need to log on to one of the computers in B-308 or B-312. Please refer to your Remote Access - GEO Labs Online instructions. You can logon to one of these computer lab workstation from your home, residence hall room or anywhere on the campus wireless network. You can also use any computer on campus or the additional online environment (General Remote Lab) since they have the ArcGIS/ArcGIS Pro software.

There will be eight different programming exercises and four required programs. The exercises are designed to introduce you to fundamental concepts and syntax of the Python language, and then the structure and utility of the geoprocessing functions of ArcGIS & ArcGIS Pro. Each will contain a specific series of tasks that may involve introduction of new syntax, programmatic problem solving, geoprocessing modular tasks, rudimentary steps in writing and running scripts, as well as debugging the program and error checking. These will be worth 5 points apiece (for a total of 40 points). Each exercise will provide pertinent background information for your independent programming work. You are also required to write four different Python programs or scripts; the first two will be stand-alone Python programs (developed through IDLE), while the second pair will be integrated modular Python scripts that will be executed through ArcGIS. Each program is worth 10 points (for a total of 40 points). These laboratory exercises and programs tally 80 points (or 80% of your final course grade). In most circumstances you will have one-week to complete each programming exercise, and a due date of at least two weeks for each script

completion or <u>program</u>. These projects should be completed and handed in by the due date indicated by the instructor. Similarly, reading assignments should be completed before the class sessions for which they are assigned.

<u>Examinations</u>: There will be one exam – a final **online** comprehensive exam scheduled for **Monday**, **December 14th (8:00 – 10:00am)**. It will be mostly composed of multiple-choice and matching questions, but you will also have a series of short programming segments (this part will be a take-home exam component). The multiple-choice questions will focus not only on basic concepts, principles, and definitions of Python programming, but also on the applications of this knowledge to pertinent ArcGIS script problems. It will count <u>20 percent</u> of your final grade.

<u>Texts</u>: **<u>A Python Primer for ArcGIS</u>**, by Nathan Jennings, CreateSpace Independent Publishing Platform, Lexington, Kentucky, 2011 _[UWSP textbook rental]_

<u>Python – Scripting for ArcGIS</u> (for ArcGIS 10) by Paul A. Zandbergen, ESRI Press, Redlands, California, 2013 _[GIS Center Text Rental]_

(optional) **<u>Learning Python</u>**, 4th edition, by Mark Lutz, O'Reilly and Associated, Inc. Sebastopol, California, 2009 _[reference Python syntax book]_

<u>Selected Readings</u> <u>Geoprocessing in ArcGIS</u>, (ESRI guide to ModelBuilder)
 from:

<u>Geoprocessing Quick Reference Guide</u>

<u>Writing Geoprocessing Scripts</u> (ESRI Python guide)

<u>Python Programming Language</u> (official website – <u>www.python.org</u>)

<u>Readings</u>: A separate handout will detail the reading assignments for the semester. Additional materials, however, such as articles, may also be given intermittently.

<u>COVID-19 Safety Measures and Requirements</u>:
We need to take extra precautions, as outlined in our the UWSP return-to-campus guidelines. Face coverings, physical distancing, hand-washing and daily symptom monitoring are essential for everyone. Extra cleaning, disinfecting, directional signage, reduced capacity in classes, labs and meeting rooms are the norm.

At all UW-Stevens Point campus locations, the wearing of face coverings is <u>mandatory</u> in all buildings, including classrooms, laboratories, studios, and other instructional spaces. Any student with a condition that impacts their use of a face covering should contact the Disability and Assistive Technology Center to discuss accommodations in classes. <u>Please note that unless everyone is wearing a face covering, in-person classes cannot take place</u>. This is university policy and not up to the discretion of individual instructors. They are mandatory based on the advice of medical professionals because, combined with physical distancing and other measures, they help protect both the health of others and the person wearing the face covering. By university policy, your instructor is not allowed to begin class unless everyone is wearing a face covering. Failure to adhere to this requirement could result in formal withdrawal from the course. If someone is not wearing a face covering (nose and mouth) they will be provided a covering (if one is available).

You are also required to maintain a minimum of 6 feet of physical distance from others whenever possible. Your instructor does not have normal 'office hours' since students cannot enter instructor's offices (due to social distancing space and ventilation issues). Please e-mail your instructor outside of class hours if help is needed in an assignment.

Attendance: Although class attendance records will not be kept for grading purposes, it is strongly urged that class sessions not be missed. Past records have shown that students who have inordinate attendance lapses have never been able to complete the course on time. HOWEVER, if a student feels ill or you have been exposed to COVID-19 DO NOT come to class. Use the UWSP screening tool to check your wellness each day - email your instructor and contact Student Health Service (715-346-4646) if you meet any of these situations. As with any type of absence, students are expected to communicate their need to be absent and complete the course requirements as outlined in the syllabus.

Attendance will be taken on the 1st and 8th week of the semester in order to comply with federal financial aid Title IV legislation attendance. UWSP Financial Aid Office is required by Federal law to retract financial aid for students that do not complete at least 60% of the semester for which they were awarded financial assistance. The mandated retraction formula uses the last date of attendance as a factor in determining the percentage of financial aid that must be returned to the U.S. Department of Education (DOE).

Student Rights and Responsibilities: Please make note of the following web-based pdf documents, that explains your responsibilities and rights within the UWSP campus community, including required behavior by students and faculty within the classroom environment:
https://www.uwsp.edu/dos/Documents/UWSP14-Final2019.pdf
https://www.uwsp.edu/dos/Documents/2015_Aug_AcademicIntegrityBrochure.pdf
https://www.uwsp.edu/dos/Documents/CH17-UWSP-Updated2019.pdf

Accommodations for Students with Disabilities:
UWSP is committed to providing reasonable and appropriate accommodations to students with disabilities and temporary impairments. If you have a disability or acquire a condition during the semester where you need assistance, please contact the Disability and Assistive Technology Center on the 6th floor of Albertson Hall (library) as soon as possible. DATC can be reached at 715-346-3365 or DATC@uwsp.edu.

Student Recording and Sharing Class Lecture
Lecture materials and recordings for Geography 441 are protected intellectual property at UW-Stevens Point. Students in this course may use the materials and recordings for their personal use related to participation in this class. Students may also take notes solely for their personal use. If a lecture is not already recorded, you are not authorized to record my lectures without my permission unless you are considered by the university to be a qualified student with a disability requiring accommodation. [Regent Policy Document 4-1] Students may not copy or share lecture materials and recordings outside of class, including posting on internet sites or selling to commercial entities. Students are also prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted lecture materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct.