Syllabus: GEOG656 - Programming and Scripting for GIS - Summer 2014

Instructor
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Office Hours: On-campus: Wednesdays, 3 to 5 pm (Also available most days by appointment)
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Teaching Assistant
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About the Course
Time: 5:30 to 8 pm Wednesdays (Lectures); 5:30 to 7 pm Thursdays (Lab Sessions)
Location: Online: http://elms.umd.edu; Campus Location: 1171 LaFrak Hall

Description
This course is an introduction to programming and scripting for intermediate GIS users. The fundamental concepts of scripting and object-oriented programming will be reviewed using the Python programming language. This course teaches students to design and write clearly structured programs and introduce ArcPy, a site package (library) providing access for all ArcGIS geoprocessing tools within Python. ArcPy is supported by a series of modules, including a mapping module (arcpy.mapping), a Spatial Analyst module (arcpy.sa), and a 3-D Analyst module (arcpy.3d). Students will develop geoprocessing programs to edit, query, manipulate, and analyze spatial data with Python and ArcPy.

The format of this course will consist of lectures, lab assignments, readings, and a final program. The lectures will be presented online via the Live Classroom on the Enterprise Learning Management System (ELMS). All lectures involve the interaction between students and instructor in real-time. Lectures will be archived into videos which will be made available on ELMS. Please note that video archives are intended for occasional or backup use in case students have to miss lectures due to personal, business, or medical reasons. Real-time, online participation is strongly recommended. The reading and lab assignments will also be posted on ELMS.

Prerequisites
The material presented by the course is crucial for anyone who works with geographic information systems and wants to customize GIS geoprocessing for particular applications. Students taking this course are expected to have basic understandings and skills in GIS. Programming experience is not required, but it is definitely a plus. This course is required for the Master of Professional Studies in GIS and the Graduate Certificate in GIS.

Textbooks
Required (only if you are new to programming and need a reference)
- Gries, P., Campbell, J., and Montojo, J. (2013) Practical Programming: An Introduction to Computer Science Using Python, Pragmatic Programmers.
Recommended
- Lutz, M. and Ascher, D. (1999) Learning Python, O'Reilly Media.
- Zelle, J. M. (2003) Python Programming: An Introduction to Computer Science, Franklin Beedle & Associates.
- Tucker (2004) Writing Geoprocessing Scripts in ArcGIS, ESRI Press (available online).

Online References
Python official homepage - http://www.python.org/
Python document - http://www.python.org/doc/

The Python Tutorial - http://docs.python.org/tutorial/
A Byte of Python (an online wikibook) - http://swaroopch.com/notes/Python/

How to think like a computer scientist: learning with Python, 2nd edition by Jeffrey Elkner et. al. -
   http://openbookproject.net//thinkCSpy/
ArcGIS 10 Desktop Help: Geoprocessing with Python -
   http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/What_is_Python/002z000000 01000000/
Geoprocessing Model and Script Tool Gallery -
   http://blogs.esri.com/Dev/blogs/arcgisdesktop/archive/2010/11/09/Geoprocessing-Model-and-Script-
   Tool-Gallery.aspx

Grading
Students are encouraged to attend each lecture and actively participate in online discussion board as well
as in class. Students are required to post a reply on the issues or questions posted by the instructor. Lab
assignments will be given on a weekly basis to help students gain practical experience in developing
programs with Python and ArcPy. Lab assignments will give students the directions to code sample
programs and then ask students to modify programs for solving the given questions. Final grades will be
determined by the following items:

Quizzes = 5%
Discussions and Participation = 5%
Lab Assignments = 70%
Final Program = 20%
The plus/minus grading system will be used to assign student grades. Minor adjustments to this scale
might be made based on the performance of the class as a whole.

Lab Assignments
There are a total of seven (7) lab assignments and each account for 10% of the final grade. The due date
will be specified in the lab document. Late submission of lab reports will result in a possible deduction of
points. However, in some situations (e.g. medical or family emergency), extension is possible if you
contact the instructor before the due date. All labs must be completed by the end of the quarter.

Software
You can use either a PC or Mac to access ELMS. Whichever you choose, it should be equipped with
headphones and microphone. You should also have the following plug-ins installed: Java, Real Media,
Flash Player, and Quicktime.

The following software will be utilized during this course:
   • ESRI ArcGIS 10.X (With ArcPy) (If you need a digital copy let me know)
   • Python 2.6 or 2.7 (Installed automatically with ArcGIS)
   • IDE (Integrated Development Environment) such as IDLE or Notepad++

The software required for this class is which is available in the open lab (located in 1136 and 1138 LeFrak
Hall) or on the Citrix server (http://geogwi.umd.edu/). Note: The free software that comes in books and
other venues does not have the ArcInfo license and cannot be used to complete most labs.

Communication
Email
Both the TA and the instructor will always be available by email. Use the email link in the sidebar to send
us an email at any time. We will try to answer within 24 hours and usually sooner.

Online / Chatroom Office Hours
If needed, I can provide online office hours if you are unable to meet on campus. To do so, simply send me an e-mail to request a time to meet online.

Offline / On-campus Office Hours
I will be available to meet on campus for face-to-face office hours at specified times. You can also email either the TA or the instructor to set up individual office hours by appointment.

Discussion Board
The discussion board is a place on the ELMS site for you to visit your classmates. This is an open forum for discussion about course material and for casual conversation. We encourage any general questions about the course material or lab assignments to be posted here so that students can help learn from each other. We will try to help answer any course-related questions that are posted here. In addition, there will be study rooms set up for you to form study groups. We will not be monitoring these rooms. Remember that the University Code of Academic Integrity specifies that you are free to work together and to discuss the assignments, but that you must produce your own original and independent work.

Class Attendance and Environment
You are strongly recommended to attend every lecture in real time at the online site or on campus at the physical classroom. We will meet online at the announced time for a live audio/video lecture. During this time you can follow along with the lecture and ask any questions that you may have. The lecture will be archived for anyone who absolutely must miss a class, but I encourage you to join the class online at the appointed time so that you can ask questions and keep up with the course schedule.

In this class, students will meet in a virtual space online which will be treated as a classroom. Our class will meet within the Enterprise Learning Management System (ELMS), the university's online learning system. Go to http://elms.umd.edu to access the course. After login, the course will be listed in the right column under "My Courses".

It is important to recognize that the classroom is an environment that requires respect for all participants. Therefore, students are expected to conduct themselves in a considerate manner.

Disabilities and Religion
Any student with a disability is encouraged to meet with the instructor privately during the first week of class to discuss accommodations. I will make every effort to accommodate students who are registered with the Disability Support Services (DSS) Office and provide a DSS accommodation form.

Please refer to the Online Undergraduate Catalog Policy on Religious Observance.

Academic Integrity
The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets the standards for academic integrity at Maryland for all undergraduate and graduate students. As a student, you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.shc.umd.edu.

Within our class, students may work together to review class notes and lab assignments. However, labs must be done individually. Students must turn in their own work without assistance from another student.

Course Schedule
This is a tentative schedule and may be adjusted. Changes will be announced and posted on Blackboard.

Week	Date	Lecture Topics	Assignments
1	Jun. 4	Course Introduction Variables, Number and String Data Types Conditionals, Loops, Functions	Exercise 1 Out
2	Jun. 11	Modules Lists Algorithms	Exercise 1 Due Lab 1 Out
3	Jun. 18	File Processing Reading and Writing TXT, CSV, ZIP Files	Quiz 1 Out Lab 1 Due Lab 2 Out
4	Jun. 25	Object-oriented Programming Creating Graphical User Interfaces	Quiz 1 Due Lab 2 Due Lab 3 Out
5	Jul. 2	Python Scripting for ArcGIS Automating GIS Workflow Model Builder	Lab 3 Due Lab 4 Out
6	Jul. 9	Geoprocessing ArcGIS Objects	Lab 4 Due Lab 5 Out
7	Jul. 16	Retrieving and Creating Messages Geoprocessing Outputs Selecting, Editing, and Adding Records to Tables	Lab 5 Due Lab 6 Out
8	Jul. 23	Getting Descriptive Information of Data Working with Geometry Objects	Lab 6 Due Lab 7 Out Final Program Out
9	Jul. 30	Listing GIS Data Creating Miscellaneous Objects Creating Custom Tools in ArcGIS	Quiz 2 Out Lab 7 Due Exercise 2 Out
10	Aug. 6	Final Program Review and Questions Spatial Analyst and 3-D Analyst Other Topics in Python Scripting for ArcGIS	Quiz 2 Due Final Program Due Exercise 2 Due

Final Programs will be due by **Aug. 10**.

Note: Lab assignments are handed out before class and are generally due after one week.