Geography 676
Programming for GIS
Winter 2011

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Lecture: Online
Tuesdays 5:30 - 8:00 pm
Website: http://elms.umd.edu
TA: Nathan Burtch (burtch@umd.edu)

Description
This course is an introduction to programming for intermediate GIS users. The fundamental concepts of procedural and object-oriented programming will be introduced in 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 Geostatistical Analyst module (arcpy.ga). Students will develop geoprocessing programs to edit, query, manipulate and analyze spatial data with Python and ArcPy.

Target Students
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 understanding 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 : if you are new to programming

Recommended

Online References
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  

ArcGIS 10 Desktop Help: Geoprocessing with ModelBuilder  

Geoprocessing Model and Script Tool Gallery  

Course Requirements and Grading
It is strongly 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:

- Weekly discussions and participation 5%
- Lab assignments and Quizzes 60%
- Final program 35%

Make-up Policy
Assignments must be turned in by the midnight at which they are due. Late assignments will result in penalties unless prior arrangements are made with the instructor. If you have a documented disability and wish to discuss academic accommodations, please contact the instructor immediately. Students should not expect ‘Incomplete’ grades as they will be only given under extra-ordinary circumstances.

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 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 homework assignments. However, assignments must be done individually. Each student must turn in his or her own work, from his or her own computer. Any discussion or problem solution must be his or her alone, without assistance from any other person.
Online Learning
This is an online course with occasional in-person experiences. We will meet online at the announced time for a live audio/video lecture. The lecture will be archived for anyone who absolutely must miss the class, but I encourage you to login at the appointed time so that you can ask questions. Our class will meet within Blackboard, the university’s online learning system. Go to http://elms.umd.edu to access the course. After you login, our course will be listed in the right column under My Courses. Click on the course link to access the course. Short videos that illustrate how to use the online learning system are available on the course page. Click the Tutorials button on the left sidebar to access the tutorials.

Hardware and Software Requirements for Online Learning
You may use either a PC or a Macintosh computer to access Blackboard. Whichever you choose, it must be equipped with the following hardware:
- Webcam
- Headset (including headphones and microphone)

You will also need the following plug-ins (be sure you have the latest versions):
- Real Media
- Flash Player
- Quicktime for PCs
- Quicktime with the Flip4Mac plugin (for Macs)

Software Requirements for Programming
- Python Software
  We will be using the Python programming language, which is available for Linux, Windows, and Macintosh computers (among others). We will be using version 2.6.2, which you can download for free online at http://www.python.org/download/releases/2.7/ Python 2.5 is available on the lab computers at 1136 and Citrix (http://geogwi.umd.edu/GeogCitrix/auth/login.aspx). Python software on Citrix will be updated.

- IDEs
  An Integrated Development Environment is a tool for browsing source code, running programs, and debugging logical errors. You may use any that you like. The labs have an IDE called IDLE installed – it comes with Python. Another IDE I like is Wing 101, which is available for free at https://wingware.com/

- ArcGIS 10, ArcPy
  ArcGIS 10 introduce ArcPy which enhances the arcgisscripting module introduced at ArcGIS 9.2. All students need to install ArcGIS 10 Desktop Education Edition on their own computer. If you didn’t get a ArcGIS 10 CD from Dr. Ma, contact with me or Dr. Ma (jma3@umd.edu). ArcGIS 10 is still not available on Citrix due to license issues and it will be installed on the Server as soon as the license issues are solved.

Support for Online Learning
This method of taking classes is undoubtedly new to some of you, so we have a few tools to make life easier for you.
Email
Both TA and instructor will always be available by email. Use the email link in the sidebar to send us emails at any time. We will try to answer within 24 hours and probably much sooner.

Online office hours
We will have office hours in a Live Classroom each week. The times will be posted in the Announcements. Use the link in the sidebar to access office hours.

On campus office hours
We will post times when we will be available on campus for face-to-face office hours. The TAs will have lab office hours on periodic Saturday mornings.

Lounge
We have created a place for you to visit with your classmates. This discussion board uses both text and voice. Share everything from discussions about the course material to what you did last weekend. I will look in from time to time but I probably won’t respond to anything posted here.

Study Rooms
Several study rooms have been set up for you to form study groups with your classmates. We will not be monitoring these rooms. Remember that the Honor Code specifies that you are free to work together to discuss the assignments but that you must then separately produce an original and independent result.

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

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<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Assignment</th>
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| 1    | Nov 30  | Course Introduction  
Overview of programming concept  
Elements of Program  
Variables and Data Types: Number  
Operators, Conditional Statements, Loop Statements  
Functions | Lab1       |
| 2    | Dec 7   | String  
Modules  
Lists and Files  
File Processing | Lab2       |
| 3    | Dec 14  | Searching and Sorting Algorithm  
Object-oriented Programming | Lab3       |
|      | Dec 21  | Winter Break              |            |
|      | Dec 28  | Winter Break (University Closed) |            |
| 4    | Jan 4   | Object-oriented Programming  
Graphic User Interfaces  
Models, Views, and Controller | Lab4       |
<p>| 5    | Jan 11  | Overview of Python Scripting in ArcGIS | Lab5       |</p>
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<th></th>
<th>Date</th>
<th>Activity</th>
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<tbody>
<tr>
<td>6</td>
<td>Jan 18</td>
<td>Automating GIS Work flow</td>
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<td>Model Builder</td>
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<td>7</td>
<td>Jan 25</td>
<td>Spatial Data Exploration using Geoprocessing (GP)</td>
<td>Lab6</td>
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<td>Spatial Data Manipulation and Editing Mapping</td>
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<td>8</td>
<td>Feb 1</td>
<td>Spatial Analysis I</td>
<td>Lab7</td>
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<td>9</td>
<td>Feb 8</td>
<td>Spatial Analysis II</td>
<td>Lab8</td>
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<td>10</td>
<td>Feb 15</td>
<td>Geostatistical Analysis</td>
<td>Final program</td>
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<td>Review, Question &amp; Answer</td>
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