Introduction to Programming for GIS & Remote Sensing

Course Number: GEO6938, Sec. 4172 (Graduate)
GEO4938, Sec. 4166 (Undergraduate)

Term: Spring 2008

Location: TUR3018
Meeting Days:
Tuesday, 10:40 am – 11:30 am (Per. 4)
Thursday, 10:40 am – 12:35 pm (Per. 4-5)

Instructor: Forrest R. Stevens
forrest@ufl.edu
207 Rolfs Hall (LUECI Lab)
352.846.3986
http://www.clas.ufl.edu/users/forrest/

Office Hours: Wednesday, 12:50 am – 2:45 pm, TUR3018
(and by appointment)

Course Description:

Objectives – There are two goals for this course. First, students will be exposed to introductory programming concepts and a history of programming computers. The goal being for students to be able to deconstruct the concrete examples presented in class written in a variety of programming and scripting languages (primarily Python, VBA, and IDL). By learning how to identify the common logic, flow control and syntactic features in programming languages, students learn the basics of these languages and how to start using the programming and scripting features of common GIS and remote sensing (RS) platforms.

Second, students will choose one or more GIS/RS platforms and explore its low-level interfaces in more depth by identifying, analyzing and solving any of a variety of GIS/RS problems programmatically (e.g. automating procedures, modeling, custom image processing, spatial statistics, etc.). Students will present these methods to the class for others to critique, analyze and learn from. Code sharing and re-use is highly emphasized, as is in- and out-of-class collaboration.

Prerequisites – GEO5134C, GEO5107C, GIS4037, GIS3043 or any other equivalent, introductory GIS or RS class. Ideally, students may have no background in programming or scripting but will at least be familiar with the GUI interfaces to ArcGIS, ERDAS Imagine, ENVI or any equivalent GIS/RS platform with a low-level interface.
Course Resources:
There is no required text for this course. However throughout the semester readings will be distributed and discussed on an as-needed basis. Most if not all of these readings will be free, online books or articles and will be posted on the class website.

E-Learning will be used as a place for distributing and submitting weekly assignments, required discussion, and class announcements:
http://lss.at.ufl.edu

Many resources may be linked to from the instructor’s course website:
http://www.clas.ufl.edu/users/forrest/teaching.html

A good introduction to programming and Python will be used extensively in the first few weeks, students may find looking through sections in advance useful for understanding in-class demonstrations:
http://www.freenetpages.co.uk/hp/alan.gauld/

Class Meetings
In general, programming concepts and theory will be presented in the one hour lectures. During the two hour class, practical examples will be discussed and in-class lab exercises will be conducted. Please, switch cell phones off; failure to do so may result in participation points being lost! Attendance in lecture is not required except if student presentations are scheduled. However, you are fully responsible for getting the information covered in lectures whether you attend or not.

The last four weeks are devoted to project work where students are working in small groups. During these weeks some class meetings are used for repetition, feedback and advices for ongoing project work. The schedule given below is subject to change depending on the interest of students and adaptation needs for the class.

Labs
Learning to program is often difficult and you have to practice. For this reason attendance in labs is required. Three percentage points will be taken off your final grade for each missed lab. Exceptions require the permission of the professor.
## Course Schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Lecture Topic</th>
<th>Lecture/Lab Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 8, 10</td>
<td>Class introduction</td>
<td>Demonstrations, software introduction/installation (ArcGIS, ENVI, FWTools/Python)</td>
</tr>
<tr>
<td>2</td>
<td>Jan 15, 17</td>
<td>Intro. to programming and history of computing</td>
<td>Lab 1: Intro. continuation, resources for learning, deconstructing a script</td>
</tr>
<tr>
<td>3</td>
<td>Jan 22, 24</td>
<td>Analyzing the problem, using the language as a metaphor</td>
<td>Lab 2: Modeling the problem and pseudo-code</td>
</tr>
<tr>
<td>4</td>
<td>Jan 29, 31</td>
<td>Data and variables, typed and non-typed languages</td>
<td>Lab 3: Statements and variable experimentation</td>
</tr>
<tr>
<td>5</td>
<td>Feb 5, 7</td>
<td>Control statements</td>
<td>Lab 4: Controlling program flow, looping, iteration, recursion</td>
</tr>
<tr>
<td>6</td>
<td>Feb 12, 14</td>
<td>Procedures and functions</td>
<td>Lab 5: Valentine’s Day Competition, making functions talk</td>
</tr>
<tr>
<td>7</td>
<td>Feb 19, 21</td>
<td>Object orientation</td>
<td>Lab 6: Introduction to objects, classes and methods</td>
</tr>
<tr>
<td>8</td>
<td>Feb 26, 28</td>
<td>Input and output</td>
<td>Lab 7: Getting files in and out of our GIS and RS platforms programmatically, raster and vector processing</td>
</tr>
<tr>
<td>9</td>
<td>Mar 4, 6</td>
<td>Code re-use, resources</td>
<td>Lab 8: Automation and batch processing in various platforms, text file processing</td>
</tr>
<tr>
<td>10</td>
<td>Mar 11, 13</td>
<td>Spring Break, no lecture or lab</td>
<td>Individual project work</td>
</tr>
<tr>
<td>11</td>
<td>Mar 18, 20</td>
<td>Guest lecture, real-life examples by Youliang Qiu?</td>
<td>Class selected topics?</td>
</tr>
<tr>
<td>12</td>
<td>Mar 25, 27</td>
<td>Guest lecture, Matt Marsik?</td>
<td>Due: Student presentations, discussions</td>
</tr>
<tr>
<td>13</td>
<td>Apr 1, 3</td>
<td>Class selected topics?</td>
<td>Due: Student presentations, discussions</td>
</tr>
<tr>
<td>14</td>
<td>Apr 8, 10</td>
<td>Due: Student presentations, discussions</td>
<td>Lab 9: Linking two or more GIS/RS processing platforms via scripting</td>
</tr>
<tr>
<td>15</td>
<td>Apr 15, 17</td>
<td>Guest lecture, Ashish Patel?</td>
<td>Reading day, no lab</td>
</tr>
<tr>
<td>16</td>
<td>Apr 22, 24</td>
<td>Making processes talk, COM/.NET/bash scripting</td>
<td></td>
</tr>
</tbody>
</table>

## Grading:

Students taking this course are graded based on their lab assignments (subtotal of 900 points), their presented project work (proposal (~2 pg.) (100 points) and final write-up (~5 pg.) and presentation (~10 min. (400 points)) and class participation (100 points). Explicit guidelines will be set for proposal and final project around mid-term. There will be no exams. However, after students have presented their project work a class discussion and critique will be conducted where class participation is required. The total amount of points to be achieved is 1500. Assignments must be submitted via E-Learning, due the date given in the exercise. For late assignments 10 points are taken off the final score for each day they are late. However, any lab may be redone and resubmitted with permission of the instructor, as long as the assignment was originally submitted on-time and the instructor deems the work not of passing quality.
Grading Scale:
A: 90% - 100%, B+: 85% - 89.9%, B: 80% - 84.9%, C+: 75% - 79.9%, C: 70% - 74.9%, D: 60% - 69%, E: Below 60%

Academic Honesty:
You are all bound by the student academic honor code:

“We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.” “On my honor, I have neither given nor received unauthorized aid in doing this assignment.”

Despite the course emphasis on code-reuse and collaboration, the final work you hand in for labs and for exams MUST be your own work or clearly cited as not your own. Do not plagiarize code or material. The first time a student is caught cheating they will get zero on the lab/test. On the second offense the student will be reported to the appropriate student body.

UF Counseling Services
Resources are available on campus for students having personal problems or lacking clear career and academic goals with interfere with their academic performance. These resources include:

University Counseling Center, 301 Peabody Hall, 392-1575 (personal and career counseling); Student Mental Health, Student Health Care Center, 392-1171 (personal counseling); Center for Sexual Assault /Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161 ext. 4231 (counseling related to sexual assault and abuse); Career Resource Center, Reitz Union, 392-1601 (career development assistance and counseling).

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

Americans With Disabilities Act:
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Student Services before bringing your request to the instructor.
Questionnaire

Name:________________________ Grad/Undergrad(Year):_______

Department:_________________________________________________

What other coursework or experience do you have related to programming, GIS, Remote Sensing (please list languages/software)?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

What do you expect to learn by taking this course?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

What concerns do you have about taking this course?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

________________________________________________________________________