**[Python] Programming for Remote Sensing and GIS**

**GIS 5090-01 — Spring 2017**

**Class Time: Tuesday 4:20 AM - 6:50 PM**

**Location: Des Peres Hall 204**

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| Instructor: Gregory Brunner (Center for Sustainability)  Office Hours: Tuesday before class and scheduled upon request  Phone: 636-222-3818  E-mail: brunnergj@slu.edu |

**Course Description (Modified from what is listed in the Course Catalog):**

This course will introduce students to python programming. Through completing this course, students will be able to use Python to perform common GIS and remote sensing analysis tasks, automate workflows, and develop custom Python tools. Topics will include describing data, manipulating data, automating spatial analysis tasks, creating Python scripts and tools, and using Python for imagery analysis.

**Course Objectives:**

* Learn Python and understand how to use it to solve problems in GIS and Remote Sensing
* Encourage the use of Python through relevant examples and assignments
* Get graduate level students implementing it in their own research projects.

**Materials:**

Course Materials are hosted at <https://github.com/gbrunner/Python_for_GIS_and_RS>. Slides, labs, and homework are in the folders that correspond to the specific week in class.

**Texts:**

(Required) Silas Toms. ArcPy and ArcGIS – Geospatial Analysis with Python. ISBN978-1-78398-866-2. $44.99

(Optional) Paul A Zandenbergen. Python Scripting for ArcGIS. ISBN 978-1-58948-282-1. $79.99

(Optional) Laura Tateosian. Python for ArcGIS. ISBN 978-3-319-18398-5. $99.00

**Assessment & Grading:**

1. 20% - Lab Work
2. 20% - Homework
3. 15% - Project 1
4. 15% - Project 2
5. 30% - Final Project

**Github – Extra Credit:**

Almost all developers use Github for versioning and sharing their code. I’ll give up to 5 percentage points for any student who creates a Github account (1%), forks the course materials and submits their assignments through Github (2%), and fixes any errors in the materials and submits the fixes to rep (2%). Depending on how much interest there is in this, perhaps I could take some time to either give an overview of Github or bring in an expert to give an overview of it.

**Grading Scale:**

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| --- | --- | --- |
| **Grade** | **Points** | **0-100% scale** |
| A | 4.0 | 93-100% |
| A- | 3.7 | 90-92.9% |
| B+ | 3.3 | 87-89.9% |
| B | 3.0 | 83-86.9% |
| B- | 2.7 | 80-82.9% |
| C+ | 2.3 | 77-79.9% |
| C | 2.0 | 73-76.9% |
| C- | 1.7 | 70-72.9% |
| D | 1.0 | 60-69.9% |
| F | 0.0 | 0-59.9% |

**Course Schedule**

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| --- | --- | --- |
| **Week** | **Class**  **Date** | **Discussion & Readings** |
| Intro | | |
| 1 | 1/17 | **Intro to Python**  **Python Basics**  **Python Fundamentals** |
| More Python Fundamentals | | |
| 2 | 1/24 | **More Fundamentals**  **Intro to Arcpy** |
| Working with Data | | |
| 3 | 1/31 | **Creating Your First Python Script (Chapter 3 of Toms)**  **CSVs and Text Files – Text to Feature Class**  **\*Project 1 Assigned\*** |
| Manipulating Data | | |
| 4 | 2/7 | **Describing GIS Data**  **Functions Overview**  **Classes and Functions (Chapter 4 of Toms)** |
| Manipulating Spatial Data | | |
| 5 | 2/14 | **Cursors – Search, Insert, Update (Chapter 5 of Toms)**  **JSON – JavaScript Object Notation**  **\*Project 1 Due\*** |
| Geometries | | |
| 6 | 2/21 | **Working with Geometries (Chapter 6 of Toms)**  **Advanced Geometry Methods (Chapter 10 of Toms)** |
| Creating Script Tools | | |
| 7 | 2/28 | **Creating and Running Python Script Tools (Chapter 7 of Toms)** |
| Classes and Function | | |
| 8 | 3/7 | **Network and Spatial Analysis with Python (Chapter 11 of Toms)**  **\*Project 2 Assigned\*** |
| Rasters/Imagery | | |
| 9 | 3/21 | **Working with Rasters**  **Managing Imagery and Raster Data** |
| Numpy, Imagery, LiDAR | | |
| 10 | 3/28 | **Working with LiDAR**  **Python Raster Function**  **\*Project 2 Due\*** |
| Map Scripting | | |
| 11 | 4/4 | **Arcpy.Mapping (Chapter 8 of Toms)**  **Map Automation and Other Arcpy.Mapping Techniques (Chapter 9 of Toms)** |
| Spatial Analysis | | |
| 12 | 4/11 | **More Spatial Analysis**  **Space-Time Analysis** |
| Hipster Python | | |
| 13 | 4/18 | **Intro to ArcGIS Python Web API and Jupyter** |
| Potpourri – I’ll Take Suggestions! | | |
| 14 | 4/25 | **Python in the Field Calculator**  **List Comprehension**  **More Pandas?**  **Scipy?**  **Multiprocessing?** |
| Final Projects Presented | | |
| 15 | 5/2 | **\*Final Projects Due\***  Each student will give a presentation on their final project. |
| Grades | | |
| 16 | 5/9 |  |

**Homework**

The purpose of the homework is twofold: to keep you thinking about Python outside of the lab and to prepare you for the next class.

**Lab Work**

**Project 1**

**Project 2**

**Final Project**