

Special Topics: Python Programming for GIS

Geog 4/590 - Fall 2014

Course Description and Learning Outcomes

This class introduces students to the automation of geospatial data collection, analysis, and presentation through the use of programming languages and graphic modeling. These tools have become key components of modern geographic analysis and data management, and provide a powerful means to collect and analyze geographic information. By the end of the class, students will have experience writing Python scripts to interact with and analyze geospatial data in ArcGIS, understand the basic concepts behind object-oriented computing languages, and be able to create graphic models and custom tools for GIS projects.

Instructor: Dr. Nick Kohler; nicholas@uoregon.edu
GTF: Masrudy Omri; rudyo@uoregon.edu

Office Hours: Tu 1-2pm
Office Hours: Th 1-2pm in SSIL

Lecture/Lab TR 10-11:50pm - 442 McKenzie (SSIL Large Lab)
Course Website: blackboard.uoregon.edu

Blackboard Class Website

Lecture notes, class handouts and information, and grades will be available through the Blackboard system located on the web at "blackboard.uoregon.edu". Your student email login will get you into Blackboard.

Grading: *late work will receive a grade reduction of 10% the first day, 20% the following day, and 50% the third day.*

40% Individual and Group Labs and Projects
45% Exams (Take Home or In-Class)
15% Final Project/Presentation

Graduate students are also required to have an annotated bibliography or short report to complement their final project

Readings:

Python Scripting for ArcGIS, 2013. Paul A. Zandbergen, and ***Online readings*** linked in this syllabus, on [blackboard](#), or linked in lecture notes and labs.

General Resources:

Introductory programming with Python -
[The Python Tutorial](#) ; [Python for non-programmers](#) ; [How to Think Like a Computer Scientist](#)

GIS Programming and Automation Class - PSU
<https://www.e-education.psu.edu/geog485/node/91> ; [“Other Sources of Help”](#)

Schedule - Draft as of Sep. 29

Date	Lecture	Reading	Lab Exercise / Homework
Week 1 Tu: 9-30	Why use GIS programming at all? Class Introduction	Ch. 1 “Introducing Python”; “Putting it all together” (PSU) ; Ch. 3 “Using the Python Window”; Ch. 4 “Learning Python Language Fundamentals”	Lab 1 - Introduction to Python - Ex. 3 “Using the Python window” and Ex. 4 “Learning Python language fundamentals”
Th: 10-2	More Python Basics - Pseudocode and Other Stuff	Ch. 2 “Geoprocessing in ArcGIS”; What is Python? ; A quick tour of Python ; What is the Python window? ; Using the Python window ; Executing tools in the Python window ; Setting environments in the Python window ; Saving, loading, and recalling your work in the Python window ; Creating workflows using the Python window	Lab 1 Continued - due on Blackboard by 10am, Tuesday 10-7 (20 points)
Week 2 Tu: 10-7	ArcGIS Geoprocessing and Python	What is ModelBuilder? ; A quick tour of ModelBuilder ; Essential ModelBuilder vocabulary ; Essential vocabulary: Executing tools in ModelBuilder ; A quick tour of advanced techniques in ModelBuilder http://blogs.esri.com/esri/esritraining/matters/2014/05/29/modelbuilder-101/	Lab 2- Tutorial: Executing tools in ModelBuilder ; Tutorial: Creating tools with ModelBuilder
Th: 10-9	GIS programming	Ch. 5 “Geoprocessing using Python”; What is ArcPy? ; Writing Python scripts ; Creating a new Python script ; Executing and debugging Python ; Setting breakpoints using Python ; Finding additional Python examples	Lab 2 Continued - due on Blackboard by 10am, Tuesday, Oct. 14.
Week 3 Tu: 10-14	Geoprocessing		Lab 3 - Ex. 5 “Geoprocessing using Python”
Th: 10-16	Exam 1	Python and Geoprocessing Basics	Lab 3 continued - due by 10am, Tuesday Oct. 21
Week 4 Tu: 10-21	Loops and iterations	Ch. 6 “Exploring spatial data” Conditionals ; Iteration ; Lists Learn Python - Loops Make Feature Layer (Data Management) ; Make Table View (Data Management) ; Copy Features (Data Management) ; Save	Lab 4 - Ex. 6 “Exploring Spatial Data”

		To Layer File (Data Management) ; Select Layer By Attribute (Data Management) ; Get Count (Data Management) ;	
Th: 10-23	loops and iterations continued.	Functions and modules ; Reading and parsing text ; Writing geometries ; Automation with batch files and scheduled tasks ; Running any tool in the box ; Working with map documents ; Limitations of Python scripting with ArcGIS What is a Python add-in?	
Week 5 Tu: 10-28	Spatial data	Ch. 7 “Manipulating Spatial Data”	Lab 5 - Ex. 7 “Manipulating Spatial Data”
Th: 10-30			
Week 6 Tu: 11-4	Accessing geometries	Ch. 8 “Working with Geometries” Ch. 11. “Debugging and Error Handling”	Lab 6 - Ex. 8 “Working with geometries”, Ex. 11 “Debugging and error handling”
Th: 11-6			
Week 7 Tu: 11-11	Raster data	Ch. 9 “Working with Rasters”	Lab 7 - Ex. 9 “Working with rasters”, Ex 12 “Creating Python functions and classes”
Th: 11-13	Creating functions	Ch. 12 “Creating Python functions and classes”	
Week 8 Tu: 11-18	Creating Tools	Ch. 13 “Creating custom tools”	Final Project Begins
Th: 11-20	Exam 2	Ch. 14 “Sharing tools” <i>turn in project proposal</i>	Final Project
Week 9 Tu: 11-25		work on project	Final Project
Th: 11-27	No Class	Thanksgiving	Take a break!
Week 10 Tu: 12-2	Project presentations	project summaries due	Final Project Draft Due
Th: 12-4	Project presentations	Exam 3	Final Project
Week 11 Tu: 12-9		8:00 Tue., Dec. 9 Take-Home Test and Final Project Due	Final Project due