Course Syllabus

Edit

GIS Programming

GIS 4102c / GEO 6938

Course Description

Many professional, advanced students, and researchers often get very familiar with GIS and geographic concepts without every working with a programming language. Often we work through Graphic User interfaces (GUI), but at some point, we often need to extend the capabilities, automate processes, or just work more efficiently to complete our primary goals to answer spatially based questions. In order to do this, we must use scripting. This course is designed to introduce you to the world of sprinting in GIS, so you can incorporate them into your workflow.

There are two primary goals for this course. First, students will learn introductory computer programming concepts and features. Students will deconstruct examples from a variety of programming and scripting languages (for example Python, R, javascript, API, and IDL), learning how to identify common logic, flow control, and syntactic features. Students will learn the purpose of these structures and how to start using the programming and scripting environments of common statistics, geographic information systems (GIS) and remote sensing (RS) platforms.

Second, students will learn how to use programming language, (i.e. Python), for scripting and geoprocessing applications. For example, students will learn algorithmic operations, implement basic programmatic concepts, load and manipulate data of different types, generate graphical output and create productive workflows. Students will then integrate these methods with GIS and advanced geoprocessing workflows via ArcGIS and the statistical processing environment, R. The primary outcome will be to facilitate students' use of programming and advanced geoprocessing via ArcGIS to analyze data of their own choosing on a final project. Students will present these methods to the class for others to critique, analyze and learn from. Code sharing and reuse are highly emphasized, as is in-and out-of-class collaboration.

Course Topics

Topics for the course are presented in the course modules of Canvas. We will work with Python in the ESRI environment, introduce Java, APIs, Earth Engine, Markup Languages, Web Programming, and others. The main goal is to get the student beyond working with a single language and learn more about the general approach os scripting and be able to use that with documentation to perform scripting in multiple environments.

Prerequisites

There are no formal prerequisites for this course, however, a basic statistical methods course (e.g. GEO3162C/GEO6160) and familiarity with ArcGIS (e.g. GEO3043/GEO5107C), either taken previously or concurrently will be greatly beneficial.

Course Resources

There is no required text for this course. All course material will be provided on the eLearning Platform (Canvas).

Optional Textbook: Zandbergen, P. A. (2013). *Python scripting for ArcGIS*. Esri press. https://www.esri.com/training/catalog/576605fb51de57f1099310ff/python-scripting-for-arcgis/

Class Meetings

In general, programming concepts and theory will be presented in a one-hour lecture. During the remaining two hours per week in-lab time, practical examples will be discussed and lab exercises will be conducted. Learning to program is often difficult and weekly labs are reserved for in-class work and one-on-one instruction.

Grading

Grades are assigned with the standard University breakdown. All labs/projects will be graded on a scale of 10. Grades will be averaged based on their category this breakdown for final grade:

- Labs: 60%
- Final Project: 30%
- Exam: 10%

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 a 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 that interfere with their academic performance. These resources are available on campus for students having personal problems or lacking clear career and academic goals that 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.

Course Summary:

Date	Details	
Thu Aug 23, 2018	Questionnaire (https://ufl.instructure.com/courses/353903/assignments/3553046)	due by 11:59pm
Fri Aug 24, 2018	Hello World (BlueJ) - Simple Java Lab (https://ufl.instructure.com/courses/353903/assignments/3553070)	due by 11:59pm
Mon Aug 27, 2018	ArcGIS Python window - Simple Python Lab (https://ufl.instructure.com/courses/353903/assignments/3553051)	due by 11:59pm
Mon Nov 19, 2018	Final Project Presentation (https://ufl.instructure.com/courses/353903/assignments/3553062)	due by 11:59pm
Thu Nov 22, 2018	Final Project Proposal (https://ufl.instructure.com/courses/353903/assignments/3553063)	due by 11:59pm
Fri Nov 23, 2018	Final Project Writeup (https://ufl.instructure.com/courses/353903/assignments/3553064)	due by 11:59pm
Sat Dec 1, 2018	Conceptual Exam (https://ufl.instructure.com/courses/353903/assignments/3553045)	due by 11:59pm
	Adding a KML (https://ufl.instructure.com/courses/353903/assignments/3553048)	
	Adding Features (https://ufl.instructure.com/courses/353903/assignments/3553049)	
	Adding Shp File (https://ufl.instructure.com/courses/353903/assignments/3553050)	
	ArcToolBox Quiz (https://ufl.instructure.com/courses/353903/assignments/3553047)	

Date	Details
	Challenge: Challenge: Temperature Converter (https://ufl.instructure.com/courses/353903/assignments/3553052)
	Challenge: Creating a Stand Alone Script (https://ufl.instructure.com/courses/353903/assignments/3553053)
	Challenge: Creating contours for the Fox Lake DEM (https://ufl.instructure.com/courses/353903/assignments/3553054)
	Challenge: Sharing Tools (https://ufl.instructure.com/courses/353903/assignments/3553055)
	Copy SHP to MDB (https://ufl.instructure.com/courses/353903/assignments/3553056)
	Creating a Google Map (https://ufl.instructure.com/courses/353903/assignments/3553057)
	Creating an ArcGIS Web Map (https://ufl.instructure.com/courses/353903/assignments/3553058)
	Decision Structures (https://ufl.instructure.com/courses/353903/assignments/3553059)
	Display a web map (Python ArcGIS API and SQL) (https://ufl.instructure.com/courses/353903/assignments/3553060)
	Feature to Raster (https://ufl.instructure.com/courses/353903/assignments/3553061)
	For Iterators in ModelBuilder (https://ufl.instructure.com/courses/353903/assignments/3553065)
	For Loop in Arcpy (https://ufl.instructure.com/courses/353903/assignments/3553066)
	Getting Started with ModelBuilder (https://ufl.instructure.com/courses/353903/assignments/3553067)
	GitHub (https://ufl.instructure.com/courses/353903/assignments/3553068)
	Global Snow Observatory (https://ufl.instructure.com/courses/353903/assignments/3553069)
	Intro to ToolBox (https://ufl.instructure.com/courses/353903/assignments/3553071)
	Introduction Module Quiz (https://ufl.instructure.com/courses/353903/assignments/3553042)
	List of Unique Attributes (https://ufl.instructure.com/courses/353903/assignments/3553072)
	Loops (https://ufl.instructure.com/courses/353903/assignments/3553073)
	Machine Learning (https://ufl.instructure.com/courses/353903/assignments/3553074)
	ModelBuilder: Exporting Script (https://ufl.instructure.com/courses/353903/assignments/3553075)

Date	Details
	ModelBuilder: Parameters (https://ufl.instructure.com/courses/353903/assignments/3553076)
	Plot at Sensor Radiance (https://ufl.instructure.com/courses/353903/assignments/3553077)
	Plot reflectance at several locations (https://ufl.instructure.com/courses/353903/assignments/3553078)
	Pseudocode for your final project (https://ufl.instructure.com/courses/353903/assignments/3553079)
	R and ArcGIS Pro (Optional) (https://ufl.instructure.com/courses/353903/assignments/3553080)
	Run a Geoprocessing tool - arcpy (https://ufl.instructure.com/courses/353903/assignments/3553081)
	Search and Find Data (https://ufl.instructure.com/courses/353903/assignments/3553082)
	Simple Python Quiz (https://ufl.instructure.com/courses/353903/assignments/3553043)
	Smarter Python Quiz (https://ufl.instructure.com/courses/353903/assignments/3553044)
	Using Python Window (Part 2) (https://ufl.instructure.com/courses/353903/assignments/3553083)
	Visualizing Imagery (https://ufl.instructure.com/courses/353903/assignments/3553084)
	Visualizing SRTM (https://ufl.instructure.com/courses/353903/assignments/3553085)