JADAVPUR UNIVERSITY
COMPUTER AIDED DESIGN CENTRE
Faculty Council of Engineering & Technology
Kolkata - 700 032

Certificate course on
<u>Programming ArcGIS with Python</u>

ArcGIS is an industry-standard geographical information system (GIS) from ESRI (Environmental System Research Institute). Like most other GIS software, ArcGIS desktop rely on a graphical user interface (GUI) with very limited need to use a command line interface or to write any code. As a result, the majority of GIS students taking their first GIS course today have never seen any form of code. Although the menu-driven user interface of ArcGIS for Desktop allows for very complicated operations and sophisticated spatial analysis, at some point users will run into tasks that require something more. That is where Python scripting comes in.

In a nutshell, Python scripting allows you to automate tasks in ArcGIS that would be quite cumbersome using the regular menu-driven interface. For example, consider having to convert 1,000 shapefiles into feature classes in a geodatabase. You could run the appropriate tool 1,000 times, but surely there must be a more efficient and robust way to do this. That is what Python scripting will do, and you need only a handful of lines of code to carry out this task. This course is designed to make the power of Python scripting available to those who have no experience writing code. The course starts with the basics, such as what scripting is and how to write and run simple lines of code using basic language constructs found in python. Following this, it covers how to write scripts that perform geoprocessing tasks with spatial data, managing map documents and layers, querying and selecting data, creating custom geoprocessing tools, customizing the ArcGIS interface, and many more.

Why Python? For a couple of reasons. First, Python is free and open source, meaning it can be freely distributed and shared. Second, it is a powerful and versatile programming language although still relatively easy to learn. Third, Esri has adopted Python as the preferred language for working with ArcGIS since version 10.

Course Duration :   36hrs

Class Duration: Theory Sessions: 2 hrs each; Practical Sessions: 2 hrs each

Eligibility: Graduate/undergraduate students of any discipline; have adequate knowledge in GIS (Geographical Information System) and ArcGIS software.

Participants must have mobile devices running Android 4.0.3 or above; laptop/desktop computer with Windows; and stable internet connectivity. Google Meet should be preinstalled in the mobile device.

Syllabus:

Topic	No. of Days	No. of Hours
Introducing Python: Introduction, Exploring the features of Python, Comparing scripting vs. programming, Using scripting in ArcGIS, Python history and versions, Exploring how Python is used, Choosing a Python script editor.	1	2
Geoprocessing in ArcGIS: Introduction, What is geoprocessing, Using toolboxes and tools, Running tools using tool dialog boxes, Using batch processing, Using models and ModelBuilder, Using scripting, Running scripts as tools, Converting a model to a script Scheduling a Python script to run at prescribed times.	2	4
Python language fundamentals: Introduction, Working with data types and structures, Working with numbers, Working with variables and naming, Writing statements and expressions, Using strings, Using lists, tuples and dictionary, Working with Python objects, Using functions, Using methods, Working with strings, Working with lists, Working with paths, Working with modules, Controlling workflow using conditional statements, Controlling workflow using loop structures, Getting user input, Commenting scripts, Working with code in the PythonWin editor.	5	10
Geoprocessing using Python: Introduction, Using the ArcPy site package, Importing ArcPy, Using tools, Working with toolboxes, Using functions, Using classes, Using environment settings, Working with tool messages, Accessing ArcGIS Desktop Help	2	4
Explore & Manipulate spatial data: Introduction, Checking for the existence of data, Describing data, Listing data, Using cursors to access data, Using SQL in Python, Working with table and field names, Parsing table and field names, Working with text files, Working with geometry objects, Reading geometries, Writing geometries, Using cursors to set the spatial reference, Using geometry objects to work with geoprocessing tools.	3	6
Automating Map Production and Printing: Introduction, Working with the ArcPy mapping module, Opening map documents, Accessing map document properties and methods, Working with data frames, Working with layers, Working with page layout elements, Exporting maps, Printing maps, Working with PDFs.	1	2
Working with rasters: Introduction, Listing rasters, Describing raster properties, Working with raster objects, Working with the ArcPy Spatial Analyst module, Using map algebra operators, Using the ApplyEnvironment function, Using classes of the arcpy.sa module, Using raster functions to work with NumPy arrays.	2	4
Creating custom tools: Introduction, Why create your own tools? Steps to creating a tool, Editing tool code, Exploring tool parameters, Setting tool parameters, Customizing tool behavior, Working with messages, Handling messages for stand-alone scripts and tools, Customizing tool progress information, Running a script in process.	2	4
Total	18	36

Certificate: Completion certificate (in printed form) will be provided at the end of the course.