Spatial Data Analysis with ArcGIS Desktop: From Basic to Advance

1. Course overview

Modern environmental, energy as well as resource modeling and planning require huge amount of geographically located datasets. To derive meaningful information and present this information in a visually appealing form require advance knowledge in Geographic Information Systems (GIS). This course is designed to give strong background in spatial data analysis and mapping within the ArcGIS environment from basic level to advance workflow. The course is mainly practical but will alternate between short lecture notes and intensive computer practical sessions on the most used geo-processing tools and tasks. It is a 5-day intensive course that will include the exploration of the ArcGIS platform, the fundamentals of spatial data and GIS, GIS data management, transformations, editing, presentation as well as geostatistical data analysis. The course will also introduce how to acquire and store spatial data. The course will also cover basic presentation of remote sensing data and their applicability for scientific modeling.

2. Who is this training for?

This spatial data analysis course is designed for environmental modelers, civil engineers, energy and environmental experts, natural resource and transport managers, Metro/Municipal/District Planning officers, researchers, the security services, agriculturalists, the extractive industries (Oil & Gas, Mining), and students interested in building and/or improving their knowledge in the ever important spatial data management. Participants with basic knowledge and experience in GIS and statistics is advantageous but not required.

3. Course requirements

The registration fees are GH₵500.00. The course fee includes costs pertaining to certificate, food as well as souvenirs for the training course. If the course is canceled, the refund will be made through the same bank account that was used to make payment for the course. The participants are strongly advised to bring along their own laptops.

4. Venue and Facilitators

This course will be held at the University of Energy and Natural Resources, Sunyani Ghana from **6th -10th August 2018.** The training will be facilitated by: **Dr. Amos Kabo-bah, Dr. Abdul Wadood Moomen and Dr. Mary Antwi.**

5. Deadline for Registration – 1st August 2018

6. Hotline: 0547807725/0505126203

7. Detailed course contents and program

Section 1: Introduction to the ArcGIS interphase and functionality

DAY 1 (Monday, 6th August 2018)

Block	**Topic**
8.00-8.30	• Registration and coffee
8.30-9.00	• Official opening of the training • Group photo
9.00-10.00	• Course introduction and overview • Introduction to GIS and Remote Sensing and their relevance for scientific modeling and planning ***(Lecture)***
10.00-11.00	• Introduction to the ESRI products, including ArcGIS Desktop and its components (ArcMap and ArcCatalog)
11.00-11.15	• ***Coffee break***
11.15-12.30	• Read and display spatial data in ArcMap • Connecting data folder (through ArcCatalog) • Arc Catalogue and file types • Adding map layers • Layout and printing
12.30-13.30	• ***Lunch***
13.30-15.00	• Data management in ArcCatalog, including creating Geodatabase
15.00-15.30	• ***Coffee break***
15.30-17.30	• Basic geo-processing tasks: sections, zooming, finding values and basic measurements • Change the coordinates of spatial data

Section 2. Working with raster data

DAY 2 (Tuesday, 7th August 2018)

Block	Topic
8.00-9.00	• Introduction to raster data and raster formats ***(Lecture)***
9.00-9.15	• Display raster data in ArcGIS
9.15-10.15	• Raster operations -merging, band arithmetic, reclassify and resampling
10.15-11.00	• Deriving topographic products- theory and practical
11.00-11.15	• Clipping rasters using polygon, shapefiles as cookie-cutter
11.15-12.30	• Extracting descriptive statistics to multiple-polygons and points from underlying raster
12.30-13.30	• ***Lunch***
13.30-15.00	• Downloading high-quality georeferenced raster data from Google Earth
15.00-15.30	• ***Coffee break***
15.30-17.30	• Georeferencing: Assigning geographic coordinates to image data • Raster extraction • Download DEM • Contours • Slope • Cut fill • Raster Analysis

Section 3. Working with vector data

DAY 3 (Wednesday, 8th August 2018)

Block	Topic
8.00-9.00	• Introduction to Vector data ***(Lecture)***
9.00-9.15	• ***Coffee break***
9.15-10.15	• Read and display shapefile data
10.15-11.00	• Exploratory shapefile data analysis and charting of shapefile attributes
11.00-11.15	• Building choropleth data thematic maps to visualize the distribution of attributes
11.15-12.30	• Add data from other sources using spatial joins • Geodatabase • Tables • Field calculator

	• Spatial overlay • Tabulate area • Buffering • Vector geoprocessing: splitting shapefiles, clipping, dissolving, merging, intersection
12.30-13.15	• ***Lunch***
13.15-15.00	• Create-edit polygon shapefile • Edit multiple shapefiles • Moving features vertices • Snap points to vertex edge • Import point data manually • Data collection with GPS and data to shape file • Getting data from Esri website • Getting Open Street data and data cleaning
15.00-15.30	***Coffee break***
15.30-17.30	• Digitizing in ArcMap (scanned map and Google Earth image)

Section 4: Introduction to basic geo-statistics

DAY 4 (Thursday, 9th August 2018)

Block	**Topic**
8.00-9.00	• Introduction to geostatistics ***(Lecture)***
9.00-9.15	• Euclidian distance rasters for quantifying the distance to different vector sources
9.15-10.15	• Density mapping- theory and practical application to map the concentration of the line and point vectors in an area
10.15-11.00	• Interpolation- theory and practical application
11.00-11.15	• hotspot analysis-identify the statistically significant clusters of high and low values
11.15-12.30	• Geographically weighted regression (GWR)- build explanatory models with spatial data
12.30-13.30	• ***Lunch***
13.30-15.00	• Model builder- Automate geoprocessing in ArcGIS
15.00-15.30	• ***Coffee break***

15.30-17.30	• Model builder- Automate geoprocessing in ArcGIS. Example of watershed processing

DAY 5 (Friday, 10th August 2018)

Section 5: Introduction to remote sensing, data acquisition and processing

Block	**Topic**
8.00-9.00	• Introduction to remote sensing ***(Lecture)***
9.00-9.15	• ***Coffee break***
9.15-10.15	• Remote sensing Data acquisition (Landsat, Sentinel, and Modis)
10.15-11.00	• Simple Land use land cover classification
11.00-12.30	• Simple Land use land cover classification
12.30-13.30	• ***Coffee break***
13.30-15.00	• Accuracy assessment
15.00-15.30	• ***Coffee break***
15.30-16.00	• Closing ceremony