



SMART TRAINERS

LESSON PLAN FOR ArcGIS GEOGRAPHIC INFORMATION SYSTEMS COURSE

COURSE TITLE:	Basic to Intermediate ArcGIS
COURSE CODE:	GIS 001
CREDIT HOURS:	02
DURATION:	08 Weeks (03 Classes Each Week)

COURSE INSTRUCTOR:	Batch:	Course Starting Date:	Course Suspension Date:
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COURSE LEARNING OUTCOMES: Upon successful completion of the course, the student will be able to: Navigate the ArcGIS Pro interface confidently and manage projects, maps, layouts, and geodatabases using industry-standard GIS workflows. Understand core GIS concepts including coordinate reference systems, map projections, spatial data models (vector and raster), and metadata standards. Import, create, edit, and manage vector and raster datasets from multiple sources including shapefiles, geodatabases, CSV, and web services. Perform spatial analysis operations — selection, overlay, buffering, proximity analysis, and network analysis — to solve real-world geographic problems. Work with raster data: perform terrain analysis (DEM, slope, aspect, hillshade), reclassification, map algebra, and raster-to-vector conversions. Design and produce professional-quality maps, dashboards, and print-ready layouts with appropriate cartographic standards. Publish maps and data to ArcGIS Online, create web maps, and perform basic automation using ModelBuilder and ArcPy scripting.

LESSON CONTENTS AND ASSOCIATED CLO(s)		
CLO	Description	Level
01	Navigate ArcGIS Pro interface; manage projects, maps, layouts, and geodatabases; understand GIS data models (vector, raster) and coordinate reference systems.	C1
02	Import, create, edit, and manage vector (points, lines, polygons) and raster datasets from shapefiles, geodatabases, CSV files, and live web services.	C2
03	Apply attribute and spatial queries, geoprocessing tools, overlay analysis (clip, union, intersect, erase), buffer analysis, and proximity operations.	C3
04	Perform raster analysis: DEM-based terrain analysis (slope, aspect, hillshade, viewshed), reclassification, map algebra with Raster Calculator, and watershed delineation.	C3
05	Design and produce professional cartographic maps and print-ready layouts with legends, scale bars, north arrows, grids, and appropriate symbology.	C3
06	Publish maps to ArcGIS Online; create interactive web maps and dashboards; automate geoprocessing workflows using ModelBuilder and introductory ArcPy scripting.	C4

Contents	Week	CLO No.	Marks Assigned	Delivery Methods	Assessment Methods
PHASE 1 — BASIC ArcGIS (Weeks 1 – 4)					
<p>1. Introduction to GIS & ArcGIS Pro</p> <ul style="list-style-type: none"> • What is GIS? Core concepts, applications, and industries • Introducing ArcGIS Pro: interface, panes, ribbon, and catalog • Creating and managing ArcGIS Pro projects (.aprx) • Understanding the map frame, scene views, and layout views • Licensing, ArcGIS Online account setup, and portal connection <p>2. Coordinate Reference Systems & Map Projections</p> <ul style="list-style-type: none"> • Geographic vs. projected coordinate systems • Common CRS: WGS 1984, UTM zones, national grids • Defining and re-projecting data (Project tool) • On-the-fly projection and datum transformations • Spatial reference properties and metadata inspection 	Week 1	01	5%	Online Lectures & Practical Work	Practical Project
<p>3. Vector Data — Import, Display & Symbology</p> <ul style="list-style-type: none"> • Vector data types: points, lines, polygons, multipart features • Adding data: shapefiles, file geodatabases, CSV with XY coords • Connecting to web services: WMS, WFS, ArcGIS REST services • Symbology: single symbol, unique values, graduated colours/sizes • Layer properties: transparency, visibility scale range, definition query <p>4. Attribute Tables & Queries</p> <ul style="list-style-type: none"> • Opening and navigating the attribute table • Field types: text, numeric, date, GUID • Select by Attribute: SQL query builder basics • Select by Location: spatial 	Week 2	01–02	5%	Online Lectures & Practical Work	Practical Project

<ul style="list-style-type: none"> relationships (intersect, within, etc.) • Field Calculator: basic expressions and field updates • Exporting selected features to new layer 					
<p>5. Creating & Editing Vector Data</p> <ul style="list-style-type: none"> • Creating a new feature class in a file geodatabase • Digitising: adding points, drawing lines and polygons • Snapping settings and topology-aware editing • Editing existing features: reshape, split, merge, move • Attribute editing and domain-based validation • Saving edits and version management basics <p>6. Raster Data — Concepts & Display</p> <ul style="list-style-type: none"> • Raster data model: cells, resolution, extent, and bands • Common raster formats: GeoTIFF, IMG, GRID, NetCDF • Adding and displaying raster datasets • Stretch renderer: min-max, standard deviation, histogram equalise • Mosaic datasets and raster catalogs • Raster resampling methods: nearest neighbour, bilinear, cubic 	Week 3	02	10%	Online Lectures & Practical Work	Practical Project
<p>7. Geoprocessing Fundamentals & Data Management</p> <ul style="list-style-type: none"> • Geoprocessing framework: tools, toolboxes, and environments • Essential tools: Clip, Dissolve, Merge, Append, Erase • Buffer tool: fixed distance, field-based, dissolve options • Spatial Join: one-to-one, one-to-many, join operations • Feature to Point, Polygon to Line, and geometry conversion tools • Geoprocessing history and result management <p>8. Table Joins, Relates & Geocoding</p> <ul style="list-style-type: none"> • Joining tables by attribute (Join Field, Add Join) 	Week 4	02–03	10%	Online Lectures & Practical Work	Practical Project

- Relate vs. join: when to use each approach
- Geocoding: address locators and creating point features from addresses
- Reverse geocoding and address candidate review
- Summarising statistics: Summary Statistics, Frequency tools

PHASE 2 — INTERMEDIATE ArcGIS (Weeks 5 – 8)

9. Spatial Analysis — Overlay & Proximity

- Overlay analysis: Intersect, Union, Identity, Symmetrical Difference
- Multi-ring buffer, Thiessen polygons, and point density
- Near tool: distance and direction from features
- Generate Near Table for multiple nearest features
- Hot spot analysis: Kernel Density and Hot Spot Analysis (Getis-Ord G_i^*)
- Optimised Hot Spot Analysis and cluster mapping

10. Network Analysis — Routing & Service Areas

- Network dataset concepts: edges, junctions, turns, restrictions
- Closest Facility analysis: shortest path to nearest facility
- Route analysis: multi-stop optimised routing
- Service Area analysis: drive-time and distance polygons
- Origin-Destination Cost Matrix for accessibility studies
- Practical case: hospital catchment area and emergency routing

Week 5

03–04

10%

Online Lectures
& Practical
Work

Practical Project

<p>11. Raster Analysis & Terrain Processing</p> <ul style="list-style-type: none"> • Digital Elevation Model (DEM): sources, import, and display • Slope, Aspect, Hillshade, and Curvature tools • Viewshed and Line of Sight analysis • Reclassify: suitability mapping and cost surface generation • Raster Calculator and Map Algebra expressions • Watershed delineation: fill, flow direction, flow accumulation <p>12. Raster-to-Vector & Image Classification</p> <ul style="list-style-type: none"> • Raster to Polygon, Raster to Point conversions • Polygon to Raster, Feature to Raster tools • Supervised image classification: training samples, Maximum Likelihood • Unsupervised classification: ISO Cluster and classification review • Accuracy assessment: confusion matrix and Kappa coefficient • NDVI calculation and change detection basics 	Week 6	04	10%	Online Lectures & Practical Work	Practical Project
<p>13. Cartography & Map Layout Design</p> <ul style="list-style-type: none"> • Cartographic principles: visual hierarchy, colour theory, balance • Advanced symbology: proportional symbols, dot density, heat maps • Labelling: Maplex Engine, label priorities, leader lines • Creating and configuring print layouts in Layout View • Map elements: legend, scale bar, north arrow, grid/graticule, inset map • Data-driven pages / Map Series for multi-page atlas production <p>14. ArcGIS Online & Web Maps</p> <ul style="list-style-type: none"> • Publishing layers from ArcGIS Pro to ArcGIS Online (AGOL) • Creating and configuring web maps in AGOL Map Viewer • Pop-up configuration: attribute display, charts, media 	Week 7	05	20%	Online Lectures & Practical Work	Practical Project

<ul style="list-style-type: none"> • ArcGIS Dashboards: building operational dashboards with charts and gauges • Sharing: groups, public access, and embed codes • Esri StoryMaps: building narrative geographic stories 					
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<p>15. ModelBuilder & ArcPy Automation</p> <ul style="list-style-type: none"> • ModelBuilder interface: adding tools, connecting data, and parameters • Iterators: iterating feature classes, fields, and rows • Model variables, inline variable substitution, and preconditions • Exporting models to Python scripts • ArcPy basics: arcpy.env, SearchCursor, InsertCursor, UpdateCursor • Running geoprocessing tools from Python and scheduling tasks <p>16. Capstone Projects & Course Review</p> <ul style="list-style-type: none"> • Capstone A: Urban suitability analysis — overlay, raster, and vector output • Capstone B: Network routing and service area map for emergency services • Capstone C: Interactive ArcGIS Online dashboard and StoryMap • Portfolio map layout: publication-ready A3 cartographic sheet • Course review, best practices, and common GIS errors • Pathways: ArcGIS Enterprise, ArcGIS Image, ArcPy advanced, QGIS comparison 	Week 8	05–06	30%	Online Lectures & Practical Work	Practical Project
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