GEOSPATIAL INFORMATION SYSTEMS

Make Money using GIS and Remote Sensing Tools

Instructor	KIMATHI JORAM
Duration	8 Weeks
Total Lessons	25 Lessons
Format	Hybrid Learning

COURSE STRUCTURE

MODULE 1: Introduction to GIS & Its Software (Week 1)	
Lesson No.	**Topic**
1	1.1 Basic GIS Concepts & Its Use Cases
2	1.2 Introduction to ArcMap, QGIS, ENVI and GEE
3	1.3 Vector vs Raster Data, Coordinate Systems

WEEK 1 ASSIGNMENT

Objective:

Understand how GIS is applied in real-world county planning and development.

Task:

Create a short report explaining how GIS is applied in one Kenyan county of your choice. Include:

- At least three GIS use cases from the county
- Identify the datasets required for each use case
- Explain the benefits of using GIS

Expected Output:

Short report (2-3 pages) in PDF or Word format

Evaluation Focus:

Understanding of GIS applications, clarity of use cases, relevance to Kenyan context

MODULE 2: Data Management & Geodatabases (Week 2)	
Lesson No.	**Topic**
4	2.1 ArcMap Geodatabases & QGIS GeoPackages
5	2.2 Raster & Vector Data in ENVI
6	2.3 Importing, Exporting, Table Joins, Metadata Management

WEEK 2 ASSIGNMENT

Objective:

Practice creating and organizing spatial data in geodatabase formats.

Task:

Build a personal file geodatabase (ArcGIS) or GeoPackage (QGIS):

- Create geodatabase with clear naming convention
- Import at least 3 vector layers and 1 raster layer
- Add proper metadata for each layer
- Organize layers into feature datasets or folders

Expected Output:

Screenshots of structure, layer properties, metadata; 1-page explanation

Evaluation Focus:

Organization structure, metadata documentation, geodatabase understanding

MODULE 3: Editing & Digitizing (Week 3)	
Lesson No.	**Topic**
7	3.1 ArcMap Editing Toolbar & QGIS Snapping
8	3.2 Digitizing Points, Lines, Polygons
9	3.3 Tracing, Reshaping, Attribute Editing

WEEK 3 ASSIGNMENT

Objective:

Develop practical digitizing skills using satellite imagery.

Task:

Digitize three layers from satellite imagery:

- Roads layer - At least 10 road segments (polylines)
- Buildings layer - At least 15 building footprints (polygons)
- Rivers/Water bodies - At least 5 features
- Add appropriate attributes to each feature
- Ensure proper topology (no gaps, overlaps, dangles)

Expected Output:

Clean shapefiles/geodatabase with three layers, screenshots, compressed folder

Evaluation Focus:

Digitizing accuracy, topology quality, attribute completeness, file organization

MODULE 4: Cartography & Map Design (Week 4)	
Lesson No.	**Topic**
10	4.1 Symbology, Classification, and Labels
11	4.2 Map Layouts in ArcMap & QGIS
12	4.3 Exporting Maps to PDF/PNG

WEEK 4 ASSIGNMENT

Objective:

Create a professional, publication-ready map layout.

Task:

Design and export professional map layout including:

- Map title, legend, scale bar, north arrow
- Data sources citation
- Your name and date
- Good color scheme and professional design
- At least 3-4 different data layers displayed

Expected Output:

High-resolution PDF map (300 dpi minimum); 1-paragraph design explanation

Evaluation Focus:

Professional appearance, map elements completeness, color scheme, cartographic best practices

MODULE 5: Spatial Analysis (Week 5)	
Lesson No.	**Topic**
13	5.1 Geoprocessing: Buffer, Clip, Merge, Dissolve
14	5.2 Overlay: Intersect, Union, Spatial Join
15	5.3 Suitability & Weighted Overlay Analysis

WEEK 5 ASSIGNMENT

Objective:

Apply spatial analysis techniques to solve a real-world problem.

Task:

Perform suitability analysis (choose one scenario: school location, health facility accessibility, agricultural suitability, or commercial site selection). Analysis must include:

- At least 3 input layers (e.g., distance to roads, population density, land use)
- Use of geoprocessing tools (buffer, clip, merge, overlay)
- Weighted overlay or multi-criteria analysis
- Final suitability map with clear classification

Expected Output:

Final suitability map (PDF), analysis steps documentation (1-2 pages), summary of findings

Evaluation Focus:

Logical criteria selection, proper tool use, analysis methodology, map quality, clear recommendations

MODULE 6: Raster & Remote Sensing (ENVI + GEE) (Week 6)	
Lesson No.	**Topic**
16	6.1 Satellite Imagery Basics (Sentinel, Landsat, USGS data)
17	6.2 Vegetation & Urban Indices: NDVI, NDBI, NDWI
18	6.3 DEM Analysis: Slope, Contours, Hillshade

WEEK 6 ASSIGNMENT

Objective:

Apply remote sensing techniques using satellite imagery and terrain analysis.

Task:

Compute two remote sensing products using GEE or ENVI:

Part 1: Vegetation Index

- Calculate NDVI for selected area using Sentinel-2 or Landsat
- Choose study area (agricultural region, national park, urban area)
- Create classified NDVI map showing vegetation health

Part 2: Terrain Product

- Choose ONE: Slope analysis OR Hillshade visualization
- Use DEM data from SRTM or ASTER
- Create properly symbolized terrain map
- Interpret results (steep areas, drainage patterns)

Expected Output:

Two maps (NDVI + Slope/Hillshade) as high-res images/PDFs; 1-page methodology report

Evaluation Focus:

Correct application of indices, proper data selection, map quality, interpretation accuracy

MODULE 7: Field Data Collection & Integration (Week 7)	
Lesson No.	**Topic**
20	7.1 GPS Data Collection & Import
21	7.2 Using QField, ArcMap, and GEE for Field Data
22	7.3 Cleaning & Integrating Data

WEEK 7 ASSIGNMENT

Objective:

Practice field data collection and integration into GIS software.

Task:

Collect and integrate field data points:

- Collect 10-20 GPS points from your area (use smartphone GPS apps)
- Record attributes for each point (name, type, description, photo)
- Export GPS data in compatible format (GPX, KML, CSV)
- Import data into QGIS or ArcGIS
- Perform table join or attribute update
- Clean the data (check errors, duplicates, coordinate accuracy)
- Create map showing field points with proper symbology

Expected Output:

Shapefile/GeoPackage with field points, attribute table screenshot, field map, 1-page process report

Evaluation Focus:

Data collection quality, GPS accuracy, attribute completeness, proper cleaning, workflow understanding

MODULE 8: Practical Projects & Portfolio Development (Week 8)	
Lesson No.	**Topic**
23	8.1 Real-world Projects: Urban Planning, Flood Mapping, School Accessibility
24	8.2 Map Production, Reporting, and Presentation
25	8.3 Portfolio Development with ArcMap, QGIS, ENVI & GEE outputs

WEEK 8 FINAL PROJECT

Objective:

Demonstrate comprehensive GIS skills through a complete mini-project.

Task:

Develop mini-project from start to finish. Choose ONE: Urban Planning, Flood Mapping, School Accessibility, Environmental Monitoring, or Custom Project (instructor approval required).

Project Components:

- Data Collection - Document all sources and collection methods
- Data Processing - Show cleaning, editing, preparation steps
- Analysis - Apply appropriate GIS techniques learned in course
- Visualization - Create 2-3 professional maps with complete elements
- Final Report - 3-5 pages with introduction, methodology, results, recommendations
- Portfolio Upload - Prepare project for portfolio presentation

Expected Output:

Complete package: Final report (PDF, 3-5 pages), professional maps (2-3 high-res), geodatabase/GeoPackage with all data, 10-minute presentation (PowerPoint/PDF), portfolio-ready summary (1 page with visuals)

Evaluation Focus:

Problem definition, data quality, analysis methodology, map design, report clarity, presentation skills, project integration, portfolio readiness

Grading Breakdown:

Data Collection & Processing (20%), Analysis & Methodology (30%), Maps & Visualization (25%), Final Report (15%), Presentation (10%)

COURSE INSTRUCTOR

Kimathi Joram

GIS & Remote Sensing Specialist