



## Series 1: Introduction to GIS & Remote Sensing

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**Lesson 1: What is GIS and Remote Sensing?** .....1-3

**Lesson Objectives:**

- Introduce geospatial studies and analysis
- Explore how geospatial studies impacts our daily lives
- Examine how GIS and remote sensing are used to support geospatial studies
- Identify geospatial focus areas where GIS and remote sensing play a key role in career development

**Lesson Exercise:** A Day in the Life of GIS

- Log daily activities
- Describe activity connection to geospatial studies
- Use internet resources to explore selected geospatial focus areas
- Relate geospatial focus areas to careers in GIS and remote sensing

**Unit 2: Introduction to Project Management**.....2-1

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**Lesson Objectives:**

- Identify the primary components of the GIS Project Management Model, including:
  - Project Planning
  - Project Implementation
  - Project Presentation.
- Analyze community projects regarding project management techniques

**Lesson Exercise:** Project Management

- Research examples of good and poor project management in local community projects using newspapers, periodicals, online sources and other resources.

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- Identify UTM zone
- Use transparent 1,000 meter grid to determine UTM xy coordinates
- Record UTM xy coordinates, distance from x, distance from y, easting, northing

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- Identify terminology associated with maps and map scale
- Identify ranges of map scale and the best uses of each

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- Identify terminology associated with maps and orienteering
- Explore the history of cartography in terms of the progression of map media
- Identify and explain point, line, and polygon map features and interpret location and data attributes
- Explore the use of a compass and distance measuring techniques and tools to map a geographic area

**Lesson Exercise:** Creating a Classroom Map

- Using measuring tape to measure boundaries of classroom
- Convert classroom measurements to grid paper at 1 foot = ¼" scale
- Measure size and distance of classroom objects
- Draw classroom objects on grid paper to scale using thematic colors
- Create classroom map legend

**Lesson Exercise:** Compass Orienteering Campus Map Exercise

- Compass components and operations
- Use a compass to find north
- Use a compass to measure the location of an object
- Record bearing degrees, ground distance, map distance of campus objects
- Map the location of measured objects to produce a campus map

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- Identify remote sensing methods of geographic data collection
- Explain how remote sensing capabilities have affected map-making and GIS technology

- Identify tools/techniques used to acquire remotely sensed data

**Lesson Exercise:** Identifying Features from Aerial Photography

- Use online TerraServer-USA website to search for local aerial photography
- Use online USGS EarthExplorer website to search by POPULATED PLACE for Digital Orthophoto Quadrangle aerial photos
- Preview and capture screen image
- Import screen image to WORD document
- Locate land features from aerial photographs
- Mark features with symbols and colors on paper or computer aerial photo
- Build legend to identify features
- Cite aerial photograph location and source
- Record symbols and colors of features identified from aerial photographs

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**Lesson Objective:**

- Identify tools and techniques used to built data layers from remotely sensed images

**Lesson Exercise:** Building Data Layers from Aerial Photography

- Overlay transparency sheet over aerial photograph of local community
- Mark common thematic features on each transparency
- Overlay all transparencies to form combined map of local community
- Identify similarities to GIS

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**Lesson Objectives:**

- Identify remote sensing methods of geographic data collection
- Explain how remote sensing capabilities have affected map-making and GIS technology
- Identify tools/techniques used to acquire remotely sensed data
- Explain the differences in bandwidth data in satellite imagery

**Lesson Exercise:** Satellite Imagery & the Electromagnetic Spectrum

- NASA Electromagnetic spectrum website
  - Radiation
  - Visibility
  - Measured energy
  - Wavelength
  - Radio waves
  - Microwaves
  - Infrared radiation
  - Visible light color and wavelength

- True color imagery
  - Ultraviolet radiation
  - X-ray waves
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    - Map screen
    - Navigation screen
    - Trip Computer screen
    - Main Menu screen
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  - Collect Data
  - Navigate
  - Find waypoints
  - Return to a waypoint
  - View all waypoints
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- Define, manipulate and view satellite properties

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- Launch STK software
- Load training scenario
- Create Basic scenario
- Populate scenario with satellites
- Define satellites
- Set satellite graphic properties
- View satellites in 2D and 3D graphics windows
- Animate satellite paths in 2D and 3D graphics windows
- Set satellite lighting
- Set satellite swath
- Add facilities to scenario
- Set facilities properties
- Access and constraints between facility and satellite
- Add sensors to scenario
- Set sensors properties

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- Identify the GPS Constellation
- Explore how the GPS Constellation satellites operate in orbit

#### **Lesson Exercise: STK GPS Satellite Constellation**

- Load GPS scenario
- View earliest active GPS satellites
- Search active GPS satellite database
- Insert recently developed GPS satellites from database
- Animate the complete GPS constellation orbit path in the 3D Graphic display
- Set ground track properties
- Rotate graphic display to view satellite constellation from varying perspectives
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    - radial
    - in-track
    - cross-track
    - range
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#### **Lesson Objectives for Lessons 1 & 2:**

- Build a geospatial technology vocabulary with terminology related to tools and functions of the ArcMap software program
- Use different geospatial data navigation techniques
- Explore elements of the ArcGIS application windows
- Explore map scale
- Identify vector features in a map display
- Identify raster cell values in a map display
- Utilize spatial bookmarks in a map display
- Interactively select features in a map display
- Explore feature attributes

#### **Lesson Exercises: Introduction to ArcGIS – ArcMap/ Navigating ArcMap**

- Launch ArcMap
- Open an Existing Map Document
- Identify the parts of the ArcMap Window
- Understand Map Scale in ArcMap
- Use ArcMap Navigational Tools (Zoom, Pan, Full Extent, etc.)
- Identify Features in a Map Display
- Use Bookmarks to Navigate in a Map Display
- Set Selectable Layers in a Map Display
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#### **Lesson Objectives for Lessons 3 & 4:**

- Build a geospatial technology vocabulary with terminology related to tools and functions of the ArcCatalog software program
- Use different geospatial data navigation techniques

- Explore elements of the ArcGIS application windows
- Explore feature attributes
- Explore different data formats
- View metadata for different data types
- Edit metadata for a data layer
- Perform data management tasks
- Search for data using geographic search criteria

### **Lesson Exercises: Introduction to ArcGIS – ArcMap/ Navigating ArcCatalog**

- Launch ArcCatalog
- Identify the parts of the ArcCatalog Window
- View Data Contents in ArcCatalog
- Identify Data Formats
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- Preview a Data Table in ArcCatalog
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- Explore Different Metadata Styles
- Copy and Paste Data Layers in ArcCatalog
- Edit Metadata in ArcCatalog
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## **Unit 2: Managing a Data Inventory**

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- Explore terminology associated with geospatial data and geospatial analysis
- Explore the benefits of a community data inventory
- Add data to a data inventory
- Explore data attributes
- Edit layer properties (layer name)
- Edit feature symbology (single symbol)
- Edit data frame properties (data frame name)
- Create a map layout with necessary map elements
- Export a map layout
- Print a map layout

### **Lesson Exercise: Displaying Geospatial Data**

- Explore Scale Thresholds
- Compare the Difference between Entities and Attributes
- Sort Records in an Attribute Table
- Add Data to ArcMap
- Change a Data Layer's Name

- Change a Data Layer's Symbology (Single Symbol)
- Set a Scale Threshold for a Data Layer
- Compare the Difference Between a Data Frame and a Data Layer
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### **Lesson Objectives:**

- Explore terminology associated with geospatial data and geospatial analysis
- Explore the benefits of a community data inventory
- Join a non-spatial data table to a spatial data table.
- Select features using an attribute-based query
- Select features using a location-based query
- Label features interactively
- Edit a map layout

### **Lesson Exercise: Managing Geospatial Data**

- Join a Spatial Data Layer to a Non-Spatial Database Table using Common Fields (Attributes) in each Table
- Select Features in a Map Display based on Attributes
- Select Features in a Map Display based on Location
- Label Features in a Map Display Interactively
- Edit an Existing Map Layout Page
- Add a Table to a Layout Page

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### **Lesson Objectives:**

- Explore terminology associated with geospatial data and geospatial analysis
- Explore the benefits of a community data inventory
- Geocode a single address
- Create a new shapefile
- Edit a data layer to add data to a new shapefile (heads-up digitize)
- Edit a map layout

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- Connect to a Commonly Used Data Folder to Lessen File-Browsing Navigation Time
- Create an Address Locator in ArcCatalog
- Geocode a Single Address in a Map Display using the Find Tool
- Create a New Shapefile in ArcCatalog

- Explore the Concept of Spatial Reference
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##### **Lesson Objectives:**

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- Export a new data layer
- Create a new shapefile
- Edit a data layer to add data to a new point shapefile (heads-up digitize)
- Add a field to a layer attribute table in ArcCatalog
- Symbolize features using the unique value method
- Edit a map layout

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- Create a Buffer around Features in a Map Display
- Show the ArcToolbox Window in ArcMap
- Selecting Features from a Current Selection of Features
- Export Selected Features as a New Data Layer
- Add a new field to an attribute table
- Enter values into an attribute table field
- Edit feature symbology (Unique Values)

#### **Lesson 5 – Preparing Data**

##### **Lesson Objectives:**

- Explore terminology associated with geospatial data and geospatial analysis
- Explore the benefits of a community data inventory
- Explore the concept of spatial reference
- Georeference an image layer to a feature layer
- Create a data layer to add data to a new shapefile (polygon features)
- Edit a map layout.

##### **Lesson Exercise: Preparing Data**

- Georeference an image data layer
- Change the coordinate system of a data frame
- Edit Layer Properties of an Image Data Layer
- Edit a data layer to add data to a new polygon shapefile (heads-up digitize)
- Change the transparency of a data layer in the map display

**Lesson 6 – Planning & Building a Local Data Inventory****Lesson Objectives:**

- Explore terminology associated with geospatial data and geospatial analysis
- Use different geospatial data navigation techniques
- Edit feature properties including symbology
- Explore feature attribute data
- Select features using attribute-based queries
- Edit data frame properties
- Create a new shapefile data layer
- Add data to a new data layer

**Lesson Exercise: Planning & Building a Local Data Inventory**

- Add local data to a new map document to begin creation of a local data inventory
- Download a shapefile from the Internet
- Extract zipped data files
- Clip the features in a data layer using the features in another data layer
- Download tabular data from the Internet
- Prepare tabular data in a spreadsheet program for use in ArcGIS
- Add tabular data to ArcMap
- Display XY tabular data in a map display