GIS\_2335\_Class\_Notes\_Week13\_04-15-25

Here’s the **bulleted notes** version of your **GISC 2335 – April 15, 2025 Lecture**:

**🗓️ Class Overview**

* Week 13: Nearing end of semester
* Portfolio project information is available; contact professor if access issues occur
* Exercise due tonight: Chapter 9
* Exercise due next Tuesday: Chapter 10
* Thursday (April 17) = Drop deadline for classes
* Course evaluations will be sent out soon — bonus points may be offered for completing

**📚 Chapter 10: Working with Rasters**

**Raster vs. Vector:**

* Raster = Pixels (cells), gets blurry when zooming in
* Vector = Math-based, stays clear when zoomed
* Raster examples: photos, satellite imagery
* Vector examples: text graphics, illustrations

**Raster Data Structure:**

* Earth's surface modeled with equally sized cells
* Each cell represents a small portion of Earth (elevation, rainfall, etc.)
* Raster attributes can be:
  + Single value (e.g., elevation)
  + Multiple values (e.g., different light wavelengths)

**Imagery and Raster:**

* "Imagery" = visual representation (photo, satellite)
* "Raster" = data model storing information in cells
* Not all rasters are imagery, but all imagery uses raster models

**🔬 Raster Resolution Types**

* **Spatial Resolution**: Size of each pixel (smaller = more detail)
* **Temporal Resolution**: How often data is captured
* **Radiometric Resolution**: Sensor sensitivity
* **Spectral Resolution**: Number of bands (wavelengths captured)

**🛰️ Raster Data Types**

* **Continuous Raster**: Elevation, rainfall
* **Discrete Raster**: Land use, soil types
* **Imagery**: Special form of continuous raster (reflectance values)

**Mosaic datasets**: Combine multiple raster datasets into one catalog for large areas.

**🛠️ Raster Tools in ArcGIS Pro**

* **Spatial Analyst (SA)** and **Image Analyst (IA)** modules
* Map Algebra: Combines raster layers with operators (example: slope calculation)
* ArcPy tools:
  + Directly import SA or IA functions to simplify scripts
  + From ArcPy.sa import \* (loads all SA tools)
* Always check if SA or IA licenses are available before running scripts

**🖥️ Raster Objects Creation Methods**

1. Referencing existing raster on disk
2. Running a geoprocessing tool
3. Using map algebra expressions

**Intermediate outputs**: Use temporary files to save space if only the final output is needed.

**📑 Raster Properties and Bands**

* Raster dataset properties: Format (TIF, JPEG), compression, sensor type
* Raster band properties: Cell height/width, pixel type, no-data values
* Use scripts to describe and list raster properties

**⚙️ Raster Analysis & Geoprocessing**

* GeoProcessing tools automate raster analysis tasks
* Example: Slope analysis using ArcPy scripting
* Map Algebra Operators (Table 10.1):
  + +, -, \*, /, relational operators (>, <, ==, !=)
* Important: Know when "greater than or equal to" includes boundary values

**🧩 Classes in Spatial Analysis**

* Specialized classes (e.g., Remap tables, Neighborhood classes)
* Used for tool parameters and data classification

**Examples:**

* RemapValue: reclassify individual values
* RemapRange: reclassify ranges

**🔁 Raster Cell Iteration (RCI)**

* Allows looping through all raster cells (row/column indexing)
* **Implicit iterator**: Single raster
* **Explicit iterator**: Multiple rasters
* Useful for analyzing or updating raster cell values programmatically

**🌟 Raster Functions in ArcGIS Pro**

* Modify raster without writing a new file
* Functions found under **Imagery tab > Raster Functions**
* Examples: Weighted overlay, Wind Chill calculation
* Output = **Virtual raster layer**, not saved to disk

**🧮 Working with NumPy Arrays**

* **Raster to NumPy array** and **NumPy array to Raster** functions
* Allows raster data to be processed using external Python libraries
* Useful for large datasets and scientific computing

**📝 Points to Remember**

* Spatial Analyst and Image Analyst modules integrate raster analysis into Python
* Raster cell iterators and raster functions streamline raster data manipulation
* Understanding raster formats, properties, and resolution critical for GIS programming
* Portfolio projects: remember minimum 3 hours of work per project

**📢 Reminders**

* **Thursday 4/17**: Last day to drop a class without penalty
* **Next week**: Final chapter (Chapter 11) — Map Scripting
* **Portfolio update**: Minimum of 3+ hours per project (file correction in progress)
* Contact Professor Bushland by email or Teams if any help is needed