

C O N T E N T S

1 *Introduction*

Welcome	1-2
Course objectives	1-2
Day 1 course content	1-3
Day 2 course content	1-4
Day 3 course content	1-5
Course materials	1-6
Additional materials and resources	1-7
ESRI Support Center	1-8
ArcGIS: a complete GIS	1-9
Logistics	1-10
Introductions	1-11
Exercise goals	1-12

2 *Raster concepts*

Lesson 2 overview	2-2
Geography as raster	2-3
Features as raster	2-4
Raster coordinate systems	2-5
Raster resolution	2-6
Raster cell coincidence	2-7
Raster resampling	2-8
Raster registration	2-9
Raster cell values	2-10
Raster attribute tables	2-11
Raster zones and regions	2-12
Raster formats	2-13
Raster format essentials	2-14
Image formats	2-15
ESRI grid format	2-16
Seven interfaces for Spatial Analyst	2-17
Analysis environments	2-18
Setting output cell size	2-19
Setting output extent	2-20
Setting snap raster	2-21
Setting analysis mask	2-22

Setting output coordinate system	2-23
Setting geoprocessing environments	2-24
Setting toolbar environments	2-25
Exercise 2 overview	2-26
3 <i>Building a raster database</i>	
Lesson 3A overview	3-2
Roadmap 3A: Building a raster database	3-3
ESRI data models	3-4
Data sources	3-5
Rasters in ArcCatalog	3-6
Geoprocessing: Raster management tools	3-7
Raster spatial reference	3-8
Raster compression	3-9
Merging rasters	3-10
Rasters in an ArcSDE geodatabase	3-11
Rasters in a personal geodatabase	3-12
Rasters in a file geodatabase	3-13
Geodatabase raster datasets	3-14
Geodatabase raster catalogs	3-15
Image formats	3-16
General properties: Pyramids	3-17
General properties: Statistics	3-18
Raster rendering	3-19
Resampling and color ramp stretching	3-20
Exercise 3A overview	3-21
Lesson 3B overview	3-22
Raster conversion tools	3-23
Conversion on the fly	3-24
Converting features to raster	3-25
Converting raster to features	3-26
Projecting rasters with ArcMap	3-27
Projecting rasters with geoprocessing tools	3-28
Geometric transformation tools	3-29
Georeferencing a raster	3-30
Georeferencing steps	3-31
Georeferencing toolbar	3-32
Adding links	3-33
Assessing link accuracy	3-34

Transforming the raster	3-35
Rectification process	3-36
Rectification must resample	3-37
Exercise 3B overview	3-38

4 *Map Algebra*

Lesson 4A overview	4-2
Map Algebra: The language of raster	4-3
Expression syntax rules	4-4
Expression evaluation	4-5
Map Algebra objects	4-6
User attributes in expressions	4-7
Special cell values in Map Algebra	4-8
Map Algebra operators	4-9
Examples of operators	4-10
Multi Output Map Algebra tool	4-11
Single Output Map Algebra tool	4-12
Map Algebra versus ModelBuilder	4-13
Spatial Analyst commands	4-14
Exercise 4A overview	4-15
Lesson 4B overview	4-16
Map Algebra functions	4-17
Function syntax rules	4-18
Local functions	4-19
Focal functions	4-20
Focal neighborhoods	4-21
Neighborhood notation	4-22
Zonal functions	4-23
Global functions	4-24
CON function	4-25
Working with NoData	4-26
Exercise 4B overview	4-27

5 *Raster processing tools*

Lesson 5 overview	5-2
Why raster processing?	5-3
Tool locations	5-4
Extract and Sample tools	5-5

Resample tool	5-6
Aggregate tool	5-7
Block Statistics tool	5-8
Expand tool	5-9
Shrink tool	5-10
Boundary Clean tool	5-11
Thin tool	5-12
Majority Filter tool	5-13
Nibble tool	5-14
Region Group tool	5-15
Exercise 5 overview	5-16
6 <i>Interpolation tools</i>	
Lesson 6 overview	6-2
Creating surfaces	6-3
Terrains	6-4
Functional surface	6-5
What is interpolation?	6-6
Linear interpolation	6-7
ArcGIS interpolation tools	6-8
The importance of samples	6-9
Controlling sample points	6-10
Inverse Distance Weighted (IDW)	6-11
IDW parameters	6-12
Natural Neighbors	6-13
Spline	6-14
Choosing a Spline type	6-15
Trend	6-16
Kriging	6-17
Kriging semivariogram models	6-18
Topo To Raster	6-19
Barriers to interpolation	6-20
Testing your surface	6-21
Feature density estimation	6-22
Exercise 6 overview	6-23

7 *Surface analysis tools*

Lesson 7 overview	7-2
Road map: Surface analysis tools	7-3
Sources of topographic data	7-4
Surface conversion	7-5
Using surfaces in ArcGIS Spatial Analyst	7-6
Contour tool	7-7
Slope tool	7-8
Aspect tool	7-9
Curvature	7-10
Hillshade tool	7-11
Visibility analysis	7-12
Visibility tools: Viewshed	7-13
Visibility tools: Observer Points	7-14
Typical visibility questions	7-15
Controlling visibility in a viewshed	7-16
Solar Radiation tools	7-17
Exercise 7 overview	7-18

8 *Hydrology tools*

Lesson 8A overview	8-2
Arc Hydro Data Model and tools	8-3
Surface hydrology tools	8-4
Roadmap: Surface hydrology	8-5
Topographic surfaces	8-6
Topo to Raster tool	8-7
Identifying and filling sinks	8-8
Flow Direction tool	8-9
Flow Accumulation tool	8-10
Creating streams	8-11
Stream Order tool	8-12
Stream Link tool	8-13
Creating basin IDs for streams	8-14
Stream to Feature tool	8-15
Roadmap: Basins and watersheds	8-16
Defining watersheds and basins	8-17
Snap Pour Point tool	8-18
Roadmap: Other operations	8-19
Flow Length tool	8-20

Performing a raindrop trace	8-21
Exercise 8A overview	8-22
Lesson 8B overview	8-23
Groundwater hydrology tools	8-24
Roadmap: Groundwater hydrology	8-25
Groundwater tool limitations	8-26
Darcy Flow tool	8-27
Particle Track tool	8-28
Porous Puff tool	8-29
Exercise 8B overview	8-30

9 *Distance tools*

Lesson 9 overview	9-2
Distance tools	9-3
Roadmap: Euclidean distance	9-4
Euclidean tools output	9-5
Calculating Euclidean distance	9-6
Euclidean direction and allocation	9-7
Weighted distance measurement	9-8
Roadmap: Weighted distance process	9-9
Creating the cost surface	9-10
Calculating travel costs	9-11
Accumulated travel cost output	9-12
Backlink output	9-13
Allocation output	9-14
Roadmap: Path Distance tools	9-15
Path Distance tool	9-16
Roadmap: Cost Path tool	9-17
Finding paths	9-18
Roadmap: Corridor tool	9-19
Exercise 9 overview	9-20

10 *Building models*

Lesson 10A overview	10-2
Modeling spatial problems	10-3
Types of models	10-4
Binary suitability models	10-5
Weighted suitability models	10-6

Weighted suitability methodology	10-7
Define the model	10-8
Break big models into submodels	10-9
Decide how to measure the issues	10-10
Data types and math in modeling	10-11
Define a scale of suitability	10-12
Determine suitability and weights	10-13
Convert measures into suitability	10-14
Reclassify tool	10-15
Reclassify with equations	10-16
Weight and combine the layers	10-17
Weighted Overlay tool	10-18
Find the best locations	10-19
Exercise 10A overview	10-20
Lesson 10B overview	10-21
Building models with ModelBuilder	10-22
Model elements	10-23
Setting tool parameters	10-24
Setting model parameters	10-25
Setting derived data properties	10-26
Running a model	10-27
Setting diagram properties	10-28
Setting model properties	10-29
Saving, exporting, and printing a model	10-30
Exercise 10B overview	10-31
Exercise 10B overview: Ski Resort model	10-32

11 Classification tools (optional)

Lesson 11 overview	11-2
Multivariate toolset	11-3
Why multivariate?	11-4
Image classification	11-5
Classification roadmap	11-6
1. Data exploration roadmap	11-7
Exploring source data	11-8
What to look for in a land cover classification	11-9
Calculating band collection statistics	11-10
The electromagnetic spectrum	11-11
Clusters and classes	11-12

2. Create a signature file	11-13
Signature file	11-14
Signature file example	11-15
2a. Supervised classification	11-16
Supervised classification – Creating the training samples	11-17
Supervised classification – Create Signatures tool	11-18
2b. Unsupervised classification	11-19
3. Analyze and edit signatures	11-20
Discovering class relationships	11-21
Calculating class probability	11-22
Other tools	11-23
Editing the signatures	11-24
4. Finalize classification	11-25
Applying the classification	11-26
Exercise 11 overview (optional)	11-27

12 *Course conclusion*

Course objectives	12-2
ESRI educational support	12-3
Learning pathways	12-4
Course evaluation	12-5
Thank you for attending	12-6