ES341 Fundamentals of GIS
Midterm Study Guide Winter 2013

Study Tips

-Read all chapters in work book, study figures and tables, compare chapters to notes
-Use study guide as a check list for knowing key terms, key concepts, key skills
-Go back through the class / lab exercises, make sure you can do the math work
-Go back through the key skills emphasized in the tutorials, make sure you know the software skills
-I would study for a minimum of 10-12 hours if I wanted to do well on this exam.
-Create a 1 page sheet of key ArcMap / Arc/Catalog commands - bring to exam
-Bring a calculator to the exam.
-Review the class slide shows on the web site for visualizations
-Meditate before exam and become one with software

Key Words

Intro to GIS
GIS defined
(list key components)
map features
points, lines, polygons
layers, themes
coverage
shape file
attributes
GPS
geodesy
spatial coordinate system
lat / long
UTM
state plane
map projection
discrete spatial features
continuous spatial features
feature attributes
vector data model
topological vector model
non-topological vector model
raster data model
attribute data
database
digitization
database tables
fields
records
data query
spatial interpolation
spatial query
symbol maps
line maps
area maps
volume maps

Intro to Topo Maps Notes
equivalence
conformality
cylindrical projection
conical projection
georeference
lat - long
meridians
parallels
equator
prime meridian
north pole
south pole
great circles
small circles
degrees-minutes-seconds
decimal degrees
magnetic north
true north
fractional scale
small scale
large scale
azimuth
compass bearing
aspect
relief
Eastings and Northings
UTM projection system
Contour lines
Index contours
Contour intervals
benchmark

Map Projections
data points
x,y coordinates
map projection
map layers
georeference system
map registration
map resolution
conformal projection
equivalent projection
polar projection
tangent vs. secant projectsion
equatorial projection
cylindrical projection
conical projection
tangent projection
standard parallel
standard meridian
central parallel and meridian
false easting , false northing
metadata
transmercator
lambert
geoide
spheroid
ellipsoid
datum
Oregon Statewide Lambert
Stateplane
UTM Zone 10-11 North
NAD1927 Datum
NAD1983 Datum
GCS

Vector Data models
points
lines
arcs
vertex
node
line segments
polyline
line
polygon
contiguous polygon
donut
island
attributes
topology
left/right poly topology
topological errors
dangling nodes
undershoots
overshoots
leaky polygons
snapped nodes
metadata
digitizing
RMS error

Raster Data Structure
grid data
raster data
grid cell
DEM
orthophoto
columns-rows / x-y
pixel resolution
vector-raster representation
cell values
integer
floating point
world file
remote sensing
satellite imagery
em spectrum
spectral bands
multispectral image
wavelength
color bands
tiff, gif, jpeg, MrSID
vectorization
rasterization

Overview of ArcGIS
ESRI
ArcInfo
ArcView
ArcGIS
GIS defined
Aspatial data
Spatial data
Database management system
GIS components
- Hardware
- Software
- Data storage/input
- Output
- Personnel

GIS Functions
- Data entry
- Data management
- Thematic mapping
- Data Analysis
- Cartographic output

Data structure
- Vector model
- Raster model

Georeferencing
- Projection
- x-y coordinates
- Cartesian coordinates

Feature Objects
- Points
- Lines/polylines
  - Vertex
  - node
- Polygons

Feature Attributes
Feature class
- Themes
- Layers

Vector Models
- Topological
- Spaghetti Models

Raster Models
- Grid / matrix
- Columns / rows
- Cells / pixels
- Pixel resolution
- Discrete Raster vs.
- Continuou Raster

ArcGIS Sofware Components
- Arc Catalog
- ArcMap
- Arc Toolbox

ArcGIS Datafiles
- Shapefiles

ArcGIS Datafiles (cont.)
Coverages
Geodatabases
Layer files
Raster (grid) files
Tables
Metadata
- FGDC Standards

File Types
- *.mxd (map document)
- *.lyr (layer file)
- *.shp (shape file-vector)
- *.coverage (vector)
- *.grd (grid file)
- *.jpg (jpeg – image)
- *.tiff (tiff-image)
- *.tfw (tiff world file)
- *.e00 (arc/info export)
- *.mdb (access database)
- *.xml (metadata)

Keyword Search Inventory

Aspatial data
Spatial data
Vector model
Raster model
Georeference
Point features
Line features
Polygon features
Node
Vertex
Feature class
Attribute
Feature ID (FID)
Grid cell
DEM
DRG
Resolution
Coordinate system
Geographic Coordinate System
Large scale vs. small scale ratios
Metadata
ArcCatalog
ArcMap
GUI
Shapefile
Geodatabase
Layer file
Table
Nominal data
Categorical data
Ordinal data
Numeric data
Interval data
Map document
Data frame
Absolute vs. Relative Pathname
Data view
Layout view
Symbology
Neatline
Map projection
Cylindrical Projection
Conic Projection
Tangent vs. Secant projection
GCS
Decimal Degrees
Cartesian Coordinate
Easting vs. Northing
Prime Meridian
Datum
Geoid
NAD27 vs. NAD83 Datum
Central meridian
Latitude of orgin
Standard parallels
False northing/false easting
Rubber sheeting
UTM
State Plane
On-The-Fly-Projection
Project Tool in ArcGIS toolbox
Define projection Tool in ArcGIS toolbox
Graticule
Map extent
Graphical scale
Relational database
Query
Logical expression
Join tables
Key field
Field Name
Field Precision vs. Field Scale
Single Precision
Double Precision
Integer vs. Floating Point

Lab Skills - In-Class Exercises
Can you work with paper maps?
What about topographic maps (contour intervals, declination, scale)
fractional scale
graphical scale
can you convert from map units to ground distance units?
Can you calculate grid resolution from column-row and easting-northing data?
What about the structure of raster models vs. vector models.
What does a coded polygon look like in the raster model vs. the vector model?
Can you relate real world spatial features to GIS map features (points, lines, polygons)?
Can you locate positions of points of longitude and latitude? UTM? State Plane?
Can you convert from degrees to minutes to seconds? How about to decimal degrees from minutes and seconds?

ArcMap Software Skills
can you open a view and add themes (vector and raster?)
can you create a layout and print?
can you set the map units and use the measure tool?
can you open a table and view the database?
can you project themes from one projection to another?
can you save a project?
can you work with feature class data? image data? grid data?
can you zoom in and out of a view?
can you use the query/identify tool?
can you change the legend colors and symbols?
can you determine the coordinates of points on a theme?
can you use metadata with your map themes?
can you define projections and change projections?
Can you load a map template and print out a final product with your name?
Can you work with tables and conduct basic statistical summaries?

Summary of Key Concepts from Price Workbook / Tutorials

Price Chapter 1 – Introduction / GIS Data
- ArcGIS Intro Skills
  - Use Identify tool
  - Use Find tool
  - Open and save map document (*.mxd) files
  - Use measure tool (measure feature, length, area)
  - Add and remove layers from display window
  - Use rt-click properties pop up window
  - Use zoom tool / Use pan tool
  - Zoom to active layer, Zoom to full extent
  - Save and open view bookmarks
  - Set and reset symbols for layers in table of contents (rt-click layer properties)
  - Select and unselect elements of feature classes
- Using ArcCatalog
  - Connecting to network drives
  - Copying and saving data

Use ArcCatalog to preview layers and show metadata
Preview layer contents
Preview data tables and map element files
Sorting table data
View metadata

Price Chapter 2 – Working with ArcMap / Mapping GIS Data

ArcMap Software Environment

Using data frames
File types and folder paths
Table of Contents/Data Frame
Layer listing
! exclamation point icon = broken folder paths
Rt-click – set data source – point to new path
Toolbars - standard (zoom, pan, etc.)
View – toolbars – check list on/off
Add data button (add layers of information)
Moving toolbars / using handles to expand and anchor
Context menus – right click on objects
Table of contents – layer management in display or map window
Set symbols, reveal layer properties
Turn layer visibility on /off
Map Window – display of map
Zooming in map window
Zoom to extents
Zoom to active layer
Zoom to previous view
Bookmarks – save views in the map window to return later
Scaling view in map window
Identifying feature attributes with identify tool
Measure distances and areas with measure tool
Rt-click on layer name in table of contents
Open attribute table
Zoom to layer
Export data
Label features
Display View vs. Layout View
Layout View
Map templates
Printing map products
Exporting layout / map products to files (*.pdf, *.jpg)

Price Chapter 11 – Coordinates and Projections

Concepts

Coordinate Pairs – Cartesian coordinates
Origin of coordinates
Map units
Coordinate space
Coordinate systems
GCS – geographic coordinate system
Equator-prime meridian

- 3-d angular measurement
- Parallels, merdians
- Prime meridian
- Latitude / longitude

- Shape of Earth
  - Spheroid
  - Datum
  - Ellipsoid
  - Geoid
- Projections
  - 2-d georeferencing
  - Projections – cylindrical, planar, conical
  - Tangent vs. secant projections
  - Orthographic projections
  - Polar vs. oblique projections
  - Projection parameters
    - Central meridian
    - Latitude of origin
    - Reference latitude
    - Standard parallels
    - False easting and northing
  - UTM – State Plane – GCS
  - UTM zones
  - State Plane Zones
  - Custom projections

  - Accuracy and precision

ArcGIS and Map Projection Functions
- ArcToolbox-Data management Tools-Projections and Transformations
  - Define projection tool (specify coordinates, creates a projection file)
  - Project tool (actively change coordinates)
- On-the-fly projection
- ArcGIS projection files

ArcCatalog and Projection Tools
- Properties – coordinate sytems tab
- Define projections

Price Chapter 3 – Presenting GIS Data / Drawing and Symbolizing Features

Concepts
- Map Types
  - Categorical (nominal) vs. numeric
  - Ordinal Data (rankings)
  - Interval Data (ranges of measurements)
  - Chloropleth – zone maps
- Single Symbol Maps
- Quantities Maps
- Dot Density Maps
- Chart Maps
- Map Classification – frequency distributions of data attributes

ArcMap Functions

Map layer files *.lyr
Symbol editing
Table of contents
Displaying rasters
Map Labels
Symbol Properties Editor
Legend properties

Price Chapter 4 – Attributes

Viewing Tables, Fields, Records
Sort by Field
Summarize by Field
Select Records – Select by Attributes
Select by Query
Table Window
Query Tool
Joining Tables
Key Fields
Calculating Fields

Price Chapter 5 – Queries

Feature Selection
Clear Layer Selection
Select by Feature
Select by Rectangle; Select by Circle
Query Tool
Identify Tool
Select by Location
Select by Attributes
Export Data