FINAL REVIEW FOR GIS (2016)
PRACTICAL COMPONENT
The first 40 mins of the exam will be open book and will require you to make a map using all the techniques learned over the semester. This map will be e-mailed to me at the end of the hour. This will be worth 20% of the final.

CLOSED BOOK COMPONENT
The last 80 mins will be closed book and be based on the material outlined in the study guide below. This will be worth 80% of the final.

Lecture 1 – Introduction to GIS
Concepts
Be able to explain the difference between a vector and raster data model.
From your readings determine when a vector data model is more appropriate then raster data.
From your readings determine when a raster data model is more appropriate then vector data.
Compare and contrast the advantages and disadvantages of the vector and raster data models.
What type of data model is best able to handle numerous attributes. Explain.

Terms

GIS	GPS	Vector Data Model	Raster Data Model
Feature	Attribute Table	Point	Line
Polygon	Pixel	RGB	Overlay Function

Lecture 2 – Coordinate Systems
Concepts
Understand how latitude and longitude can be used to locate your position on earth
What is the difference between decimal degrees and degrees, minutes, seconds. How can you convert between these two formats.
What is the difference between a geographic and planar coordinate system.
Understand how the UTM system works
What is the significance of a standard parallel
In Texas, what type of map project is used for its SPCS? Do you know why?

Terms

Georeferencing	Latitude	Longitude	Decimal Degrees
Geographic Coordinate System	SPCS	UTM	Equator
Planar Coordinate System	Prime Meridian	Lambert Conformal Conic	
Degrees, Minutes, Seconds	Standard Parallels	Transverse Mercator	
Standard Quadrangle			

Lecture 3 – Map Scale
Concepts
What is the difference between a small and large-scale map
Why should one be wary of generalization. What generalization and how can it affect geographic data?
What are the standard scales used by the USGS in their maps?

What is the National Map Accuracy Standard? Know how to calculate how this standard can be used to determine how accurately entities can be located with a map.

Terms

Fractional Scale	Graphic Scale	1:24,000	1:62,500
1:100,000	1:250,000	Large Scale Map	Benchmarks
Small Scale Map	Generalization	National Map Accuracy Standard	

Lecture 4 – Datums and Projections
Concepts
What is the difference between a geoid and an ellipsoid
Why is it critical for GIS layers to share a common datum?
What is the importance of the scale factor?
Why can you not have a map projection that preserves all four properties?
Know in detail the map projections used for UTM and SPC systems.
Be sure to check out the Interactive Album of Map Projections and the USGS map projections website

Terms

Datum	Geoid	Ellipsoid	WGS 84
NAD 27	NAD 83	Map Projections	Scale Factor (SF)
Equidistance	Equivalence	Conformal	Azimuthality
Cylindrical	Conic	Pseudo-Cylindrical	Azimuthal
Universal Transverse Mercator		Lambert Conformal Conic	
Albers Equal Area	Tangent	Secant	

Lecture 5 – Vector Data Model - Features
Concepts
What are the three ways that a geographic entity can be represented with vector data?
What is the difference between the file format type and data format type in an attribute table?
Understand how many significant digits are valid for features in the geographic and planar coordinate systems
Why would a user select a vector data model for a non-discrete feature like soils or land cover?
Understand the different levels associated with attributes in a DBMS
What are the advantages of using topological datasets? Any disadvantages?
Know about the common file formats used for vector data

Terms

Terms	Node	Point	Polyline
Polygon	Vertices	Ontology	Spaghetti Approach
Intersection	Small Gap	Undershoot	Topologic Approach
Dangling Arc	Coverage	Shapefile	TIGER
DLG	Attribute Table	DBMS	Ratio
Interval	Nominal	Ordinal	Thematic Mapping

Lecture 6 – Raster Data Model
Concepts
For what type of features is the raster data model more appropriate? And the vector data model?
What are the different characteristics that define a raster data layer?
For raster data what is the general relationship between file size and pixel resolution.
Make two lists. What are the advantages of the raster data model? Disadvantages? Do the same for vector data

Terms

Pixel Resolution	Lossy compression	Loseless compression
RGB	ESRI Grid	GeoTIFF
GeoPDF	DBMS	Georelational File Structure
Geodatabase		

Lecture 7 – GIS Data Capture and Metadata
Concepts
Clearly know the difference between primary, secondary, and tertiary data capture
Know about the different techniques for GIS secondary
data capture
Make a list of active GIS websites that you can potentially obtain data from for your final project
What are the different metadata formats?
Make a list of the different types of information that you can find within a metadata file

Terms

Primary Data Capture	Secondary Data Capture	Tertiary Data Capture
Metadata	Digitizing Tablet	Heads Up
Digitizing	Data Conversion	Vectorization
Rasterization	Control Points	Rubbersheeting
Benchmarks	CSDGM	ISO

Lecture 8 – Error and GPS Technology
Concepts
Know the difference between precision and accuracy
Know how to calculate precision based on the National Map Accuracy Standard
and accuracy with RMSE
What is the difference between systematic and random error
Outline the different specific types of errors that can degrade a GPS signal
Be able to describe the different segments within the GPS system
Be able to explain how PDOP is related to the number and orientation of GPS satellite overhead
Know about how different GPS receivers operate and how they vary in terms of accuracy

Terms

Precision	Accuracy	RMSE	Systematic Error
National Map Accuracy Standard		Random Error	GPS
Signal to Noise Ratio	LIDAR	Trilateration	PDOP
WAAS	Pseudo-Random Code		Differential GPS

Lecture 9 – Reference Map and Aerial Photos
Concepts
Know about the different scale maps offered by the USGS
Check out the USGS Map Symbol PDF
How are different colors used to represent diverse features on a USGS map
What are the three main mapping products offered by the USGS
What steps are needed to transform an aerial photo into an orthophoto

Terms

DRG	DLG	DOQ	NAIP
Reference Map	L2	Orthorectified	Principal Point
Thematic Map	Photogrammetry	Stereoplotter	Orthophoto

Lecture 10 – Thematic Mapping
Concepts
Examine section 3.18 from DiBiase. From reading this section can you understand how it is possible to lie with a map
Know about the different type of thematic maps
Know about the different classification methods that can be used to aggregate data
What is the hierarchy of geographic units within the US Census
Make a list of best practices that should be followed when making a map. Use these the next time you make a map. If you don't you will lose points

Terms

Reference Map	Thematic Map	Data Aggregation
Choropleth Map	Dot Density Map	Isopleth Map
Graduated Circle Map	Equal Interval	Classification Method
Natural Breaks	Quintile	County
Census Track	Block Group	Block

Lecture 11 – Geographic Analysis I
Concepts
Know the five different types of GIS analysis you can conduct with a dataset
What is the difference between an analytic and locational overlay.
Know about the different tools that can facilitate a locational overlay.
Understand how model builder could be useful when you have numerous, repetitive operations to complete

Terms

Select by Location	Select by Attribute	Dissolve Tool
Clip Tool	Merge Tool	Intersect Tool
Union Tool	Model Builder	

Lecture 12 – Geographic Analysis II
Concepts
What type of data model is required to complete an analytic overlay

Why is it often important to normalize your data when making a thematic map. What are the different ways in which you can normalize your data?
Think about ways in which you can lie with a thematic map
Know about the different types of buffers that are possible
What is spatial interpolation and what are some of the different spatial interpolation methods?
How can you normalization a data set based on time to determine a rate of change.

Terms

Analytic Overlay	Raster Math	Thematic Mapping
Normalization	Inverse Distance Weighing (IDW)	Boolean Algebra
Buffer Tool	Kriging	Set Algebra

Lecture 13 – Remote Sensing
Concepts
At which wavelengths is the earth's atmosphere transparent. These are the wavelengths that are most useful for remote sensing
Know how the spectral response can differ for different types of land covers
Know the difference between the different types of resolution that can be applied in remote sensing
Be familiar with some of the remote sensing products that exist. Know whether they image the visible, infrared, or ultraviolet parts of the spectrum
Know about the steps that are required to processes a multi-spectral satellite image

Terms

EM Spectrum	Visible Light	Infrared	Microwaves
Blackbody	RGB	Spectral Response	Spatial Resolution
Spectral Resolution	Temporal Resolution	KVR-1000 / SPIN-2	SPOT
Radiometric Resolution		DMSP	DMSP
IKONOS	Landsat	MODIS	GPM
Imagine Classification		SMOS	
TOPEX-POSEIDEN	SMAP	TRMM	

Lecture 14 – GIS Data Products
Concepts
Know how contour lines are drawn from raw data
What are the advantages and disadvantages of representing elevation with a vector and raster data model
Know about the different products used to represent elevation
Know about the different data sets available for water related features
Know about the different data sets available for soils, land use and transportation

Terms

DLG	TIN	DEM	Counter Line
Contour Interval	VMAP-0	NED	ETOPO2
GTOPO30	Viewshed	NHD	NWI
Space Shuttle Topography mission		MMU	STATSGO

FEMA 100-year Floodplain   SSURGO   NLCD