**GIS in Water Resources Review for Midterm Exam**

**Topics**
- Introduction to GIS in Water Resources
- Introduction to ArcGIS software
- Exercise 1: Introduction to ArcGIS
- Data sources for GIS in water resources
- Exercise 2: Building a Base Map for the San Marcos Basin
- Geodesy, Map Projections and Coordinate Systems
- Spatial analysis using grids
- Exercise 3: Spatial analysis
- DEM’s, watershed and stream network delineation
- Exercise 4: Watershed and stream network delineation

**Expected Skills**
- Convert degree, minute, second coordinates to decimal degrees, and vice versa
- Determine the length of a line along a meridian, parallel or great circle on a spherical earth.
- Determine the length of a line when using projected coordinates.
- Sketch on a map the standard parallels, central meridian, and latitude of origin for a given projection (the coordinates of origin, what earth datum, what projection)
- Determine the statistics (e.g. average value or sum) of an attribute of a selected set of features satisfying a logical query
- Be able to take the parameters of a map projection and interpret what they mean (focus on geographic, State wide and State Plane projections)
- Know the common national data sources for GIS in Water Resources and their GIS data formats (vector, raster, point, line, polygon etc.)
- Be able to perform raster calculations for spatial analysis and understand the concepts involved.
- Be able to calculate slope on a DEM
- Take a small grid of elevation cells, fit pits, calculate the flow direction and flow accumulation grids, and determine the watershed draining to an outlet cell.
- Derive Geomorphologic and Watershed attributes from a DEM derived drainage network. These include, channel length, drainage area, and drainage density.
- Be able to use interpolation tools to obtain spatial fields from point data and explain the function and interpret the output of these tools.
- Be able to use zonal statistics tools to obtain averages of spatial fields such as precipitation and slope over watersheds and catchments. Explain the function and interpret the output from these tools.
- Be able to create point layer from Excel file and or join a dbf table to other layers and themaitc map based on flow.