

EVR 7056 GIS in Water Resources  
Department of Environmental Studies  
Spring 2008

Location: GL 274  
Time: MW 3:00 - 4:15 PM  
Instructor: Assefa M. Melesse  
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Office Hours: MW 2:00-3:00 PM

### **Course Description**

The course will acquaint students with the application of geospatial analysis to water resources. Both vector and raster GIS will be used to analyze and model watershed processes. Grid-based input data preparation, watershed delineation, flow analysis, routing, overland and channel flow estimation and hydrograph development will be covered. Modeling water quality in a GIS environment will be covered. The use of GIS and remote sensing in spatially distributed watershed analysis, mapping and modeling will be presented using lectures, home works and project.

### **Objectives**

The course is designed to help students to

1. acquaint themselves with geospatial tools in watershed analysis
2. create and process spatial data for hydrologic modeling
3. acquire hydrologic input parameters from remotely-sensed data
4. understand modeling protocols in geospatial hydrology
5. understand and use geospatial statistics in watershed analysis
6. analyze spatial flow, runoff and water balance

**Prerequisite:** EVR 4934/GIS 5050 or equivalent, EVR 4962 or equivalent or permission of instructor

### **Required Text:**

ESRI. 2002. ArcHydro: GIS for Water Resources. Environmental Systems Research Institute, Inc. Redlands, CA.

### **Additional Reference**

Gurnell, A. M. and D. R. Montgomery. 2000. Hydrological applications of GIS. John Wiley & Sons, Inc. N.Y., NY.

## GRADING:

Attendance	5%
4 Home works	30%
Class Exercises	10%
1 home take Exam	20%
Final Project	35%

A	90-100
B+	88-89
B	80-87
C+	78-79
C	70-77
D+	68-69
D	55-67
F	<55

- Students are required to attend classes regularly
- Late home works will be subjected to point deductions
- Two power point presentations ( proposal and final result) and a final report will be required

## **COURSE OUTLINE**

<b>Lec. #</b>	<b>Topic</b>
1	Course Overview Introduction to Hydrology, Hydrological cycles, processes and water balance
2	Review of ArcGIS <b>Homework 1</b>
3	Review of ArcGIS cont.
4	<b>Exercise 1: Displaying, querying and editing hydrological data</b>
5	Geodesy, coordinate systems, georeferencing and map projections: working with georeferenced data <b>Homework 1 Due</b>
6	<b>Exercise 2: Water balance of Lake Okeechobee and Water Conservation Areas in a spatial context</b> Creating maps and reprojection
7	Spatial and non-spatial data sources for water resources <b>Exercise 3: Working with hydrological data from DBHYDRO, SFWMD and other sources</b> <b>Home work 2</b>

8	Raster GIS and Geospatial data analysis
9	<b>Exercise 4: Spatial analysis using grids</b>
10	Terrain analysis using grid <b>Exercise 5: Terrain analysis</b> <b>Home work 2 Due</b>
11	Watershed and stream network delineation Digital Elevation Models Sink filling, stream burning, Flow direction, flow accumulation <b>Homework 3</b>
12	Contributing area and stream network Flow length Watershed delineation Model Builder
13	<b>Exercise 6: Slope, aspect, sink filling, flow direction, flow accumulation and stream burning</b>
14	Project proposal presentation
15	Project proposal presentation <b>Homework 3 Due</b>
16	<b>Exercise 7: Watershed delineation and stream networking</b>
17	Storm runoff modeling Concept of excess rainfall Interception, infiltration Curve number <b>Homework 4</b>
18	<b>Exercise 8: Runoff depth computation</b>
19	Soil erosion and water quality issues
20	<b>Exercise 9: Soil erosion estimation using GIS tools</b>
21	<b>Exercise 10: Water quality analysis using the Simple Method</b>
22	GIS and Remote sensing integration Electromagnetic spectrum Sensors and platform
23	Impervious surface area mapping and storm runoff response <b>Homework 4 Due</b>
24	Evapotranspiration (ET) modeling Empirical techniques Soil water balance Surface energy balance, remote sensing based ET
25	<b>Final home take Exam</b>
26	Project preparation
27	Final project presentation
28	Final project presentation <b>Paper Due on the final week</b>