

*Eastern Kentucky University*  
**Department of Geosciences**  
**GEO 501/701: Evaluation of Water Resources with GIS CRN: XXXXX**  
**3 Credit Hours**  
*Spring Semester,XXXX*

**Instructor:**

*Office:*

*Email:*

*Office Hours:*

**Prerequisite or Corequisite:** GEO 353 or department approval.

**Course Description:**

Water resources are a necessity of both life and economic growth that vary in time and space. Determining the quantity of water and protecting its quality continue to be a challenge as economies grow and technology advances. In GEO 501, students will learn how to conduct professional water resource investigations by utilizing Geographic Information Systems (GIS) to collect and analyze hydrologic data. We will focus on the tools private industries and municipalities use to characterize hazards, strategize cleanup efforts, and protect source waters.

The class will include introductory material in natural water flow systems and GIS analysis that will be practiced in weekly computer labs. Computer labs will focus on practical issues in water resource evaluation such as conducting water budgets, analyzing watersheds, finding groundwater recharge zones, predicting contamination sources, and finding flood plains. This class will include a semester long project where students will produce a source water protection report for a Kentucky county of their choosing. For the project, students will utilize the data sources from class (United States Geologic Survey, United States Department of Agriculture, Kentucky Division of Water, Kentucky Geologic Survey, National Hydrography Dataset, and Environmental Protection Agency) to explore how water resources interact with the geology and land use in the county and produce a report detailing priority zones for protection and concern.

**Text Book:**

None. We will be reading professional reports and academic articles during the class. These will be found online or provided.

**Student Learning Outcomes:**

1. Spatially integrate different types of data to assess the impact of geology, groundwater pumping, and land use on groundwater and surface water sources. Including point clouds, lines, polygons, and raster data sets.
2. Critically evaluate different sources of hydrologic data in Geographic Information Systems in order to assess common hydrological problems such as water source protection, contaminant transport, and water budgeting.
3. Critically read reports and academic sources in order to improve understanding of water flow systems of interest. (ex. Estimating groundwater recharge of an area).
4. Communicate hydrologic hazards and risk to the general public.
5. Create a source water protection report that considers natural and human aspects groundwater and surface water flow systems.

**Communication:** Other than office hours, the best way to communicate with me is through email. Please note that I do check my email regularly, but I may not see your email until the next day. In the event that I need to communicate with you or clarify something, it will be sent via university email (please check your email regularly).

**Grading:**

In class practice	5%	50 points
Quizzes	10%	100 points
1 <sup>st</sup> Quarter Submission	20%	200 points
Midterm Submission	20%	200 points
3 <sup>rd</sup> Quarter Submission	20%	200 points
Final Project submission	25%	250 points

A letter grade at the end of the semester will be determined using the scale below.

A	>90%	>900 Points
B	89-80%	899-800 Points
C	79-70%	799-700 Points
D	69-60%	699-600 Points
F	>60%	<600 Points

**Class Project:** The class project will be the main focus of class. For this project you will choose a county in Kentucky and create a water resources report from public, professional, and academic data. Every week there will be a specific task to complete and write up into approximately 2 pages of the report. The specific task will go along with lecture. At the end you will have a complete report of groundwater and surface water resources as well as their quality. The report will be graded in 4 stages. At each point you will submit roughly 1/4<sup>th</sup> of the project.

**Lectures and Practice:** Lectures and reading are used to explain the basic concepts and provide a foundation for homework. You are expected to be an active learner in the course by both attending class and keeping up with the assigned readings. Your understanding of this material will be assessed through in-class practice, quizzes, and the final project.

**Quizzes:** Quizzes will be given outside of class time to assess student comprehension of the material and to help prepare for the final exam. Quizzes will take approximately 10-30 minutes.

**Final Exam:** During our final period your project will be due. Each student will present their project in power point form and answer questions.

### **Student Progress:**

All activities listed under **grading** will be used to assess your performance in this course.

Grades will be regularly posted on blackboard so that you can check your progress. You can withdrawal from the course until Feb 11<sup>th</sup> without a fee (Apr 8<sup>th</sup> with a fee).

### **Attendance Policy:**

Students are expected to attend class and actively participate in all aspects of the learning process. This includes class discussions, written work, and in-class activities. National and local studies have shown a direct correlation between attendance and grade performance. **Therefore, attendance is mandatory.** For the purposes of this course, "excused absences" include verifiable medical or family emergencies, University approved activities (accompanied by a University excuse), illness and other absences (that must also be documented) as outlined in the University's policy 4.1.6R. An excused absence is not a pass on missed material, nor does it guarantee make up on in class labs/activities, which cannot be replicated on an individual basis. It is the student's responsibility to obtain notes and catch up on material that is missed. In general an excused absence will result in make up for exams and quizzes at the discretion of the instructor. Late arrival or early departures from class may also be considered unexcused absences.

### **Last Day to Withdraw:**

See Colonel's Compass

### **Disabilities Statement:**

The University strives to make all learning experiences as accessible as possible. If you are registered with the ECU Center for Student Accessibility (CSA), please obtain your accommodation letters from the CSA, present them to the course instructor, and discuss the accommodations needed. If you believe you need an accommodation and are not registered with the CSA, please contact the office in 361 Whitlock Building by email at [disserv@ecu.edu](mailto:disserv@ecu.edu) or by telephone at (859) 622-2933. Upon individual request, this

syllabus can be made available in an alternative format.

A student with a “disability” may be an individual with a physical or psychological impairment that substantially limits one or more major life activities, to include, but not limited to: seeing, hearing, communicating, interacting with others, learning, thinking, concentrating, sitting, standing, lifting, performing manual tasks, working. Additionally, pregnancy accompanied by a medical condition(s), which causes a similar substantial limitation, may also be considered under the Americans with Disabilities Amendments Act (ADAAA).

**Discrimination Statement:**

Discrimination, harassment, or violence will not be tolerated at ECU. ECU is committed to a respectful and inclusive environment and thus prohibits discrimination, harassment, or violence of any kind. It also requires faculty members to report any information that may indicate that discrimination, harassment, or violence has affected any member of the University community. If you share information that indicates that you have witnessed or experienced such behavior, that information will have to be provided to University officials; consider this in choosing what information you post. If you would like to obtain confidential help from someone who does not have to report the information, please go to ECU’s webpage for Title IX information for resources.

**Academic Integrity:**

The standardized academic integrity statement can be found at the following link:  
<http://academicaffairs.ecu.edu/syllabi>.

**Official ECU E-mail:**

ECU email is considered the official communication between ECU Faculty and ECU Graduate students. In this course, only ECU student email accounts should be used for communication purposes. A student's failure to receive and read University communications delivered to his/her official email address in a timely manner does not absolve the student from knowing and complying with the content.

**Course Requirements:**

- Students are responsible for all material presented in lecture, readings, homework, and labs.
- Missed quizzes will receive a zero, except (1) when special arrangements have been made with me ahead of time, or (2) with documentation of a medical emergency or other excusable reason as delineated in EKU Policy 4.1.6R.
- Late assignments are inexcusable and will not be taken for any reason except those specified by EKU Policy 4.1.6R.
- Unclaimed homework, lab reports and exams will be destroyed after

**Course Outline:**

	Date	Topic	Lab	Notes	Due
Week 1		Introduction and Course Project			
		Databases and Tools	Excel, GIS, Data Types		
Week 2		Introduction to Hydrologic Cycle and Water Protection	Choose your KY County		
		Working Period 1	Base Maps		
Week 3		Precipitation, Climate, Collection	Snow, Rain, PRISM		
		Working Period 2	Interpolate Precipitation		
Week 4		Evapotranspiration	Penman-Monteith		
		Working Period 3	Calculate ET for County		
Week 5		Surface Water and Water Budgets	Precipitation-ET		
		Working Period 4	Surface Water, USGS		
Week 6		Runoff Processes			Submission 1
		Working Period 5	TWI and Slope Stability		
Week 7		Floods and Stream Networks			
		Working Period 6	Stream Order and Floods		
Week 8		Groundwater 1			
		Working Period 7	Geology and Aquifers		
Week 9		Spring Break		No Class	
		Spring Break		No Class	Submission 2
Week 10		Groundwater 2			
		Working Period 8	Karst and Saltwater		
Week 11		Groundwater 3			
		Working Period 9	Wells, Springs, Pumping		
Week 12		Spatial modeling			
		Working period 10	Spatial Models		
Week 13		Water Quality			
		Working Period 11	Water Quality		
Week 14		Water Quality			Submission 3
		Working Period 12	Contaminants 1: Landuse		
Week 15		Water Quality			
		Working Period 13	Contaminants 2: Sources		
Week 16		Contaminant Tracing			
		Working Period 14	Contaminants 3: Model		