

BSE4344 Geographic Information Systems for Engineers
BSE5344G Applied Geographic Information Systems

Spring 2016

Instructor: Dr. Venkat Sridhar **Graduate Teaching Assistant: Ms. Jordan Wetzig**
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Course Meetings: TTh 8:00-9:15 AM & Fri 8:00-9:55 AM; 105 Seitz Hall

Required Text: Harder, C., T. Ormsby, and T. Balstrom. 2013. *Understanding GIS: An ArcGIS Project Workbook, 2nd Edition*. ESRI: Redlands, CA. Pp. 392.

Additional Reading: Additional readings assignments will be assigned to reinforce the material covered in the lectures. These readings will be from the course textbook, online sources, and various reports and journal articles.

Required Equipment: Laptop Computer

Course Description

The objectives of this course are to develop necessary skills and knowledge related to the applications of Geographic Information Systems (GIS) in pre- and post-processing of model inputs and outputs, spatial analysis and interpretation. Arc Hydro data model, tools, functionality and examples of real-world water resource problems and integration of external models will be covered.

Topics Include:

- Introduction
- Coordinate Systems
- Vector Data Model
- Raster Data Model
- Data Exploration
- Raster Data Analysis
- Vector Data Analysis
- Arc Hydro
- Time Series
- Hydrological Modeling (ArcSWAT, ArcHydro-Groundwater, HEC-GEOHMS)

Software: ESRI ArcGIS 10.3 for Desktop and the spatial analyst extension

A 1-year student license is available (free) at the Student Software Center in Torg 3240 (at the library end of the Torg-Library Bridge). **BE SURE TO GET VERSION 10.3**

Install the ArcGIS for Desktop and the spatial analyst extension by second class period

Class Website: Scholar (scholar.vt.edu). Check the course website daily for course announcements, updates, and reminders.

Learning Objectives: Having successfully completed this course, the student will be able to:

- Give examples of different types of products and applications of GIS;
- Describe characteristics of spatial data;
- Explain georeferencing, and convert/use data from different projections and coordinate systems;
- Describe characteristics, advantages, and disadvantages of raster and vector data models;
- Encode and edit spatial data and discuss important characteristics of the process;
- Discuss factors affecting errors, accuracy, and data quality;
- Access and make appropriate use of public sources of spatial data;
- Read, interpret, and summarize current research studies utilizing GIS technology;
- Categorize, describe and apply vector and raster spatial analysis functions;
- Demonstrate spatial analysis operations using sample data;
- Implement GIS models using available software.

Grading and Evaluation: Each student's grade in the course will be determined as follows:

<i>BSE 4344</i>		<i>BSE 5344G</i>	
Laboratory Assignments	50%	Laboratory Assignments	50%
Annotated Reviews	15%	Annotated Reviews	15%
		Expert Lecture -Project*	10%
Two Tests	30%	Two Tests	20%
Quizzes/Class Participation	5%	Quizzes/Class Participation	5%

*Project will be in place of a final exam

Annotated Reviews: Four annotated reviews of peer-reviewed journal articles will be submitted throughout the semester. An annotated review is typically a one page summary and analysis of an article. Guidelines and examples will be available on our class Scholar site. The articles should be recent (since 2008) and can be on any topic related to geographic information systems (GIS).

Expert Lectures (BSE5344G ONLY): By March 15th, each graduate student will submit a proposal/abstract for their chosen project. Between April 26th and May 3rd, each student will submit a project report and make a presentation that illustrates how to use GIS to answer a research question of his/her choosing. This presentation will be no longer than 20 minutes. During the presentation, the student should provide sufficient background, state the research question, and explain the proposed methodology. The annotated reviews should be selected to help prepare for this presentation.

Course Policies

It is expected that students will not disturb or distract others or in any way interfere with the ability of other students to learn the course material. Individuals whose actions create a distraction or disturb other students or the instructors will be asked to cease the disrupting activity or leave the classroom. Use of electronics other than laptops for GIS use *only* (IPad, cell phone, etc.) is strictly prohibited in class unless the students are otherwise notified.

Submitted Assignments:

Homework and laboratory assignments must be prepared and presented in a professional manner. Due dates will be given on each assignment. Late assignments will be penalized 10% for each calendar day late, up to 20% penalty. Assignments submitted after **Tuesday** will not receive any score. **All labs must be completed and submitted in order to receive credit for this class.**

Disability Statement:

Reasonable accommodations are available for students who have a disability. Students should contact the Services for Students with Disabilities (SSD), 150 Henderson Hall, 231-3788 (V), 231-1740 (TTY); Susan P. Angle, spangle@vt.edu, www.ssd.vt.edu. "Students with disabilities are responsible for self-identification....To be eligible for services, documentation of the disability from a qualified professional must be presented to SSD upon request. Academic adjustments may include, but are not limited to: priority registration, auxiliary aids, program and course adjustment, exam modifications, oral or sign language interpreters, cassette taping of text/materials, notetakers/readers, or assistive technology."

Honor Code Statement:

The Honor Code will be strictly enforced in this course. All assignments submitted shall be considered graded work, unless otherwise noted. All aspects of your coursework are covered by the Honor System. Any suspected violations of the Honor Code will be promptly reported to the Honor System (see <http://www.honorsystem.vt.edu/>). The following is the Honor Code written verbatim from the VT Honor System Constitution:

The Honor Code is the University policy that expressly forbids the following academic violations:

1. Cheating -- Cheating includes the actual giving or receiving of any unauthorized aid or assistance or the actual giving or receiving of any unfair advantage on any form of academic work, or attempts thereof.
2. Plagiarism -- Plagiarism includes the copying of the language, structure, ideas and/or thoughts of another and passing off same as one's own, original work, or attempts thereof.
3. Falsification -- Falsification includes the statement of any untruth, either verbally or in writing, with respect to any circumstances relevant to one's academic work, or attempts thereof. Such acts include, but are not limited to, the forgery of official signatures, tampering with official records, fraudulently adding or deleting information on academic documents such as add/drop requests, or fraudulently

changing an examination or other academic work after the testing period or due date of the assignment.

While group work on laboratory assignments is encouraged to facilitate cooperative learning, each student is expected to complete each assignment him/herself and to turn in his/her own work unless otherwise notified. Copying of another student's work (currently or previously enrolled students) is not allowed. Utilizing the same computer to complete the assignment is not allowed. Copying (either direct cut and paste or slight rewording) of written material, such as from the internet or another student's work, is strictly forbidden. All exams should be solely and completely the work of the individual student. ***Violations of the Honor Code will be turned over to the Honor Court.***

Virginia Tech's Principles of Community:

Virginia Tech is a public land-grant university, committed to teaching and learning, research, and outreach to the Commonwealth of Virginia, the nation, and the world community. Learning from the experiences that shape Virginia Tech as an institution, we acknowledge those aspects of our legacy that reflected bias and exclusion. Therefore, we adopt and practice the following principles as fundamental to our on-going efforts to increase access and inclusion and to create a community that nurtures learning and growth for all of its members:

- We affirm the inherent dignity and value of every person and strive to maintain a climate for work and learning based on mutual respect and understanding.
- We affirm the right of each person to express thoughts and opinions freely. We encourage open expression within a climate of civility, sensitivity, and mutual respect.
- We affirm the value of human diversity because it enriches our lives and the University. We acknowledge and respect our differences while affirming our common humanity.
- We reject all forms of prejudice and discrimination, including those based on age, color, disability, gender, national origin, political affiliation, race, religion, sexual orientation, and veteran status. We take individual and collective responsibility for helping to eliminate bias and discrimination and for increasing our own understanding of these issues through education, training, and interaction with others.
- We pledge our collective commitment to these principles in the spirit of the Virginia Tech motto of *Ut Prosim* (That I May Serve).

Grade Scale

The final percentage will be converted to a letter grade based on the ranges listed below.

A	93%	-	100%
A-	90%	-	92.9999%
B+	87%	-	89.9999%
B	83%	-	86.9999%
B-	80%	-	82.9999%
C+	77%	-	79.9999%
C	73%	-	76.9999%

C-	70%	-	72.9999%
D+	67%	-	69.9999%
D	63%	-	66.9999%
D-	60%	-	62.9999%
F	0%	-	59.9999%