Geography 343/543   Geographic Information Systems II

Spring, 2018

Instructor: Dr. Keith Rice

Office Hours: Tuesday & Thursday   11:00 – 11:50am
                        or by appointment

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This is an intermediate level, computer-based course that explores the latent abilities of geographic information systems. The complexity of spatial data bases, resolution & scale issues, differential global positioning systems (DGPS), applied cartographic modeling, geodemographics, relational spatial data formats, remote sensing data acquisition and delivery, rudimentary three-dimensional modeling, visualization, and programming issues will all be explored in regard to a GIS.   The class will concentrate on the integration of data from different sources and their applications within a large-scale GIS. Both land management systems data (e.g., street networks, parcel maps) and natural resource land management data (e.g. land use, habitat cover) will be examined. Students will use GIS pc-workstations along with *ESRI*-GIS software (ArcGIS (ArcMap & ArcCatalog), ArcServer, ArcScene). Remote sensing software (i.e. *ERDAS Imagine*) will also be used to demonstrate applications within GIS.

Lecture: Lecture sessions will be on Tuesday and Thursday mornings, and will concentrate on both the basic theoretical and applied techniques of geographic information systems. The lectures will lay the foundation for the laboratory assignments.

Laboratory: There is one weekly laboratory session, two hours on either Monday afternoon (section 1 @ 2:00 – 3:50pm), or Thursday afternoon (section 2 @ 2- 3:50pm). Each laboratory will deal with one aspect of a GIS, that may involve either the introduction of a new technique, or a GIS database or design problem - all within an application situation. There are 10 laboratory projects, each counting between 5 and 7 percent of the final grade for a total of 60 percent of your grade for the course. The requirements for each laboratory session will be outlined in each individual lab assignment. Most of the laboratory projects will take longer than the allocated two hour period since all assignments either require field work or extensive time on computer equipment.

Students can use the Computer Geographics Lab (Science,B-346), the Spatial Information Analysis Lab (SIAL) - (Science, D-326), the Advanced Computing Lab (TNR-322), or the GIS/Remote Sensing Lab (Science, B-310/312), or the B-308 computers (when class is not in session). Some labs will utilize software that is only located in B-308, B-312 or B-346 (this will be noted during discussion of the assignment). Students will use ArcGIS (ArcMap, ArcCatalog, ArcToolbox) and several specialized extensions, ArcGIS Server, ERDAS Imagine, and other GIS related programs to finish the assignments. Lab assignments need to be completed and handed in on or before the due date indicated by the instructor. If you need help with any assignment, please see your class instructor.

Textbook: Geographic Information Science and Systems, 4th edition (2015)
                        Longley, Paul A., Goodchild, Michael F., Maguire, David, and David Rhind
                        John Wiley & Sons, New York, NY, 2015

Instruction
GIS Manual: Geography 343/543 Laboratory Manual – 2018 Edition (Volumes I & II)

Reference	Getting to Know ArcGIS Desktop, 4th edition ESRI Press, 2015	($45 - $85)
Textbooks:	Michael Law, Amy Collins	
	GIS Tutorial 1: Basic Workshop, 10.3 edition	($50 – $80)
	Wilpen Gorr and Kristen S. Kurland	
	GIS Tutorial 2: Spatial Analysis Workshop, 4th edition	($50 - $80)
	David Allen	
	GIS Tutorial 3: Advanced Workbook	out-of-print
	David Allen and Jeffrey Coffey	(used copies only)

These optional *'textbooks'* should only be purchased for the *serious GIS user* due to their cost. These textbooks are handy for anyone considering using ArcGIS 10.3+ or any type of GIS-related research project and some may be available in the University bookstore. If not, you can order these books over the Internet (e.g. www.amazon.com).

Examinations: There will be two examinations, a *mid-term* on March 15th, covering the first eight weeks of the course, and a *final comprehensive exam* **(Thursday, May 17th, 2:45 – 4:45pm)**. The mid-term will be composed of both multiple-choice and matching questions that will focus not only on basic concepts, principles, and definitions, but also on the applications of this knowledge to pertinent GIS problems. It will count 20 percent of your final grade. The final examination will be worth 20 percent of your course grade, and will be of similar structure to the midterm.

Readings: A separate handout will outline the main reading assignments of the semester. Additional reading materials will be assigned during the term.

Evaluation & Grading*:*

	Maximum Points
Laboratories (ten total, 5 -7 points apiece)	60 points
Midterm Exam	20
Final Exam	20
Total	100 points

Ranges of percentage scores, exam points, course points, and their approximate equivalent letter grades are shown below. By referring to this table you can determine your letter-grade standing at any point in the course.

Percent	5 Pt Lab	6 Pt Lab	7 Pt Lab	Course Pts.	Letter Grade
93-100	4.7	5.6	6.5	93	A
90	4.5	5.4	6.3	90	A-
87	4.4	5.2	6.1	87	B+
83	4.2	5.0	5.8	83	B
80	4.0	4.8	5.6	80	B-
77	3.9	4.6	5.4	77	C+
73	3.7	4.4	5.1	73	C
70	3.5	4.2	4.9	70	C-
67	3.4	4.0	4.7	67	D+
63	3.2	3.8	4.4	63	D
<63	<3.2	<3.8	<4.4	<63	F

Attendance: Although class attendance records will not be kept, it is strongly urged that class sessions not be missed. Also keep in mind that the success of class discussions is keyed to verbal participation and one person can make a significant difference in aiding a classmate's understanding of a topic.

Student Rights and Responsibilities: Please make note of the following web-based pdf documents, that explains your responsibilities and rights within the UWSP campus community, including required behavior by students and faculty within the classroom environment: http://www.uwsp.edu/stuaffairs/Documents/RightsRespons/rightsCommBillRights.pdf, and http://www.uwsp.edu/stuaffairs/Documents/RightsRespons/SRR-2010/rightsChap14.pdf

Printing Costs: During the course of the semester each student will be responsible to hand in several word documents, reports, and associated maps. All student printers are handed through UWSP-IT so you will be charged for 5 cents for each B&W page (single side) as well as 15 cents for each color copy (single side). You start out with $10 in a UWSP printing account for the semester (for all of your classes) and then are charged a fee at the end of the semester for any printing exceeding that initial balance. You can always check your student printing account on your myPoint portal page on the Finances tab. Although it is *only an estimate*, you likely will print out 30-40 B&W pages and 15 color pages during the course of the semester for this class. Additionally, you will be creating two poster plots (large format printing) later in the semester that you will not be charged (paper & ink will be covered by the department).

Accommodations for Students with Disabilities:
UWSP is committed to providing reasonable and appropriate accommodations to students with disabilities and temporary impairments. If you have a disability or acquire a condition during the semester where you need assistance, please contact the Disability and Assistive Technology Center on the 6th floor of Albertson Hall (library) as soon as possible. DATC can be reached at 715-346-3365 or DATC@uwsp.edu.

Additional Requirements for Geography 543:

Students taking Geog. 543 (graduate credit) are required to conduct a separate GIS project that involves a topic of their choosing. It is usually to the advantage of the graduate student to select a topic related to their thesis or graduate school interest. The final project will consist of a paper and associated maps that are a synopsis of a natural resource problem that was solved using ArcGIS 10.5.1 or ERDAS Imagine or a combination thereof. Graduate students should discuss with the instructor their chosen topic before beginning the project. Final grades will be termed using the following formula:

Geog. 343 requirements	80% of final grade
GIS final project	20% of final grade

GEOGRAPHY 343/543: GEOGRAPHIC INFORMATION SYSTEMS 2

** <u>Schedule of Lecture Topics, and Laboratory Assignments</u> **

Spring, 2018

	<u>Lecture Topic</u>	<u>Laboratory</u>
<u>January</u>		
23 & 25	Course Overview & Introductory Comments Spatial Databases: Errors, Accuracy & Standards Metadata and Data Dictionaries GIS Data Management & Data Custodianship	-----
<u>February</u>		
(Jan 30) & 1	Developing and Building Spatial Models GIS User Interface & Display Management Systems	1: Cartographic & Spatial Modeling (6)
6 & 8	Raster-based Spatial Analysis with ArcGIS Conversion Cell Statistics & Boolean Operations Raster Calculator & Attribute Table Summaries	2: ArcGIS Spatial Analyst　　(6) - surface analysis
13 & 15	Global Positioning Systems Overview GPS High Accuracy Techniques Brief Review of Coordinate Systems	3: Differential GPS Positioning (6)
20 & 22	Differential GPS: Real Time & Post-Processing Comparison of GPS Equipment & Techniques Integration of GIS and GPS	*[no lab]*
<u>March</u>		
(Feb 27) & 1	Image Rectification and GPS Integration Integration of Remote Sensing Data w/GIS Digital Imagery for the Nation Program	4: Imagery Integration (6)
6 & 8	Network Analysis & Geocoding Principles Spatial Socio-Economic Data Address Matching & Address Databases	5: Network Analysis & Geocoding (6)
13	Network Analysis & Geocoding Principles *Mid-term Exam Review Session*	6: Spatial Structures & Landscape Fragmentation (6)
15	**Midterm Exam**	
20 & 22	GIS & Retail Trade Geodemographics Landscape Structure & Morphology Statistical Modules for ArcGIS	7: Terrain Modeling (6) Surface Rendering

<u>March</u>

27 & 29   -- *Spring Break Vacation* –

<u>April</u>

3 & 5	Spatial Pattern Analysis using GIS	8: Resolution & Scale
	TIN/GRID Surface & Terrain Modeling	GRID Spatial
	Managing 3D Data & Surface Models	Modeling (7)
	3D Visualization with GIS	
10 & 12	Raster-Based Spatial Modeling	9: Designing & Utilizing
	Resolution & Scale Issues – Accuracy Variations	ArcGIS Server (5)
	ArcGIS Server Overview & Introduction	
	ArcGIS Online & ArcGIS Server Configurations	
17 & 19	ArcGIS Server Architecture & Services	10: GIS Animation w/
	Creating an ArcGIS Web Site	ArcScene (6)
	GIS Web Design & Presentation	
24 & 26	Building GIS Data Layers for ArcGIS Server	*[open lab]*
	Programming Concepts & Customization	

<u>May</u>

1 & 3	Geoprocessing Scripts in ArcGIS (Python)	
	Automation and Geoprocessing Functionality	*[no lab]*
	Understanding the Basics of Python Scripts	
8 & 10	Incorporation of Customization & Environmental Settings	
	Geodatabase (MDB) ArcGIS Formats	*[no lab]*
	Geodatabase Relationships – Types & Rules	
	Final Exam Review and Summary	

Final Exam: Thursday, May 17th; 2:45 – 4:45pm

Comments:

(1) The worth of each laboratory (in points) is denoted within the parentheses next to each lab title.

(2) This schedule is tentative and is subject to changes during the course of the semester.