Department of Forest Resources
University of Minnesota
FNRM 5131- GIS for Natural Resources – Fall 2019 (*09/3/2019 – 12/11/2019)*

	FNRM 5131				
In-person	Lecture: Tuesday & Thursday, 3:00–3:50 p.m., B25 Ruttan Hall, & one of the following:				
	8:30 a.m. –	10:25 a.m.	Wednesday	35 Skok	Section 4
	12:50 p.m. –	2:45 p.m.	Wednesday	35 Skok	Section 2
	9:35 a.m. –	11:30 a.m.	Thursday	35 Skok	Section 3
On-line Lab	(you can also come to any in-person lab session if/as needed)				Section 5, 21
On-line Lecture	(see Class Website); (you can also come to any in-person lecture if/as needed)				Section 20

Instructors: Paul Bolstad, 301H Green Hall, 612-624-9711, pbolstad@umn.edu; Andrew C. Jenks, 215 Green Hall, 651-387-9600, ajenks@umn.edu

Office Hours: Paul Bolstad: by appointment, Andrew Jenks: Tuesday/Thursday, 12-1:50 pm (215 Green) & Google Hangouts, Wed 8pm-9pm

Required Texts: *GIS Fundamentals: A First Textbook on Geographic Information Systems, Sixth Ed.*, Bolstad, Paul V., XanEdu Publishing, 2019. This book is on reserve in the Natural Resources Library 375 Hodson Hall and should be at the St. Paul Campus Bookstore, and at the website https://www.xanedu.com/higher-education/educators/custom-books-catalog/gis_fundamentals_6e/. Readings from this book are required. There are also supplementary readings, which will be posted on the class web link, http://giscourses.cfans.umn.edu/fnrm5131. **You should do the readings before class meets; there is a quiz each week prior to start of each Tuesday lecture on the week's reading assignment**.

Required Materials: You may download and print the exercises as PDFs from the class website, http://giscourses.cfans.umn.edu/fnrm5131. Throughout the labs sessions you will need to save/backup your work. You will be provided UMN class disk space, L:\home*{your id}*, used it for your work.

Other Resources: The class website is http://giscourses.cfans.umn.edu/fnrm5131. This website has copies of this syllabus, and lab exercises. A related website, http://paulbolstad.net/gisbook.html has information on the textbook.

Student Responsibilities: You should attend the lectures (or access on-line lecture materials), do the readings, do assigned lab and homework problems submit them via Moodle; complete all quizzes and exams via Canvas. All material from lectures and readings may appear on the examinations.

If you need any assistive devices, services, or accommodations, due to a disability, please contact the Instructor.

FNRM 5131 Schedule

NOTE: Readings are from the required textbook, *GIS Fundamentals; A First Textbook on Geographic Information Systems, Sixth Edition*, by Paul Bolstad. All lab sections meet 1st week

Week	Lecture Topic -- Tuesday/Thursday	Labs & Homework	Required Readings	On-Line Exams
1	Course Introduction: Course mechanics Introduction to GIS, data models, data structures.	**\L1:** Intro. and practice with ArcGIS	Chapters 1 & 2	
2	Geodesy, datums coordinate systems, map projections	**\L2**: Projections	Chapter 3 & ESRI PDF, Understanding Map Projections (skim)	
3	Maps, data entry & editing, metadata, map transformations	**\L3**: Digitizing	Chapter 4	Exam 1 (Chapters 1,2,3)
4	GPS, begin aerial and satellite images	**\L4**: Topology; optional lab **\L5:** GPS (due end of 8th week) Due: Semester Project Part 1	Chapters 5 & 6 up to pg. 273	
5	Continue aerial and satellite images, digital data, data sources,	**\L6**: Digital Data and Basic Table Operations	Chapter 6 to end & Chapter 7,	Exam 2 (Chapters 4,5,6)
6	Introduction to Tables & relational databases	**\L7**: Tables Due: Semester Project Part 2	Chapter 8, up to pg. 357	
7	Tables, normal forms	**\L8**: Table Import and Join **Homework 1 due Friday**	Chapter 8, pg. 358 to end	
8	Basic spatial analyses	**\L9**: Buffering, overlay	Chapter 9	Exam 3 (Chapters 7,& 8)
9	Raster analysis	**\L10**: Raster Analysis **Homework 2 due Friday**	Chapter 10	
10	Terrain analysis, more spatial analysis	**\L11**: Terrain and more spatial analysis	Chapter 11	
11	Interpolation, prediction, core area delineation.	**\L12**: Interpolation	Chapter 12	Exam 4 (Chapters 9, 10, & 11)
12	Cartographic modeling, flowcharts	**\L13**: Grouse Habitat Modeling Due: Semester Project Part 3	Chapter 13	
13	No Class – Thanksgiving	**No Labs, Thanksgiving week**		
14	More cartographic modeling, dynamic spatial models, standards, data quality	**\L14:** Cartographic Modeling	Chapter 14	
15	New developments/future trends (Tuesday only)	Continue Lab 14 **Lab 14 & Semester Project Part 4 due Fri.**	Chapter 15	Exam 5 (comprehensive, but weighted, towards Chapters 12-14)
16	Finals Week			

Overview

FNRM 5131 is an introduction to geographical information systems, focusing on spatial data development and analysis in the science and management of natural resources. Many of our most pressing environmental problems involve "what" and "where," for example, which coastal communities are in danger of sea-level rise, what intersections are most dangerous for traffic, where might an oil spill cause the most damage, or which power plants are causing the most acid rain? We have developed tools, called GIS, which help us address many of these problems, but there are dangers as well as opportunities here, as our conceptions and values as much determine our recommendations as do our technical capabilities. This course seeks to impart both a technical expertise and the basis to evaluate how our conceptual framework affects our conclusions. The course provides a technical understanding of the tools needed to solve these environmental problems, and how we may select the best tools to use in any given problem. Topics covered in this course include basic data models (data views), structures, data sources, data collection, data quality, geodesy and map projections, spatial and tabular data analyses, digital elevation data and terrain analyses, cartographic modeling, cartographic layout, and metadata, and accuracy assessment. Laboratory exercises provide practical experiences that complement the theory covered in lecture.

This course introduces the methods and models that have been developed to solve spatial problems. Computers have enabled sophisticated, affordable, and easy spatial analysis. For example, spatial technologies allow us to identify the specific communities and households downwind of any given coal-fired power plant, and estimate the specific levels of particulates, sulfates, mercury, and other noxious pollutants we expect to fall on each household. This allows a fuller, fairer measure of the costs in siting, expanding, or upgrading such plants. Water pollution, the distribution of resources, risk to natural disasters, crime analysis, and endangered species recovery are examples of other problems that have been addressed with spatial analyses.

Mechanics

You may complete the exercises at a campus computer lab or at home. You should read the lab in advance, and review/note new procedures or activities. Labs may require more than the two-hour period to complete. The Skok35 and Green 210A labs (as well as other UMN Computer Labs) are open additional hours.

Several options exist for access to the required ArcGIS software and data *(you choose the approach; you can use any of the options or switch between as needed throughout the class).*

1. Attend class lab session and use the provided computers, software and data.

2. Install the UMN provided Citrix receiver software and then access the CFANS virtual desktop via a web browser. This will allow direct network computer access to ArcGIS without installing ArcGIS on your computer. *(this approach can be used with Windows or MacOS computers).*

All Labs assignment will to be submitted via Canvas, https://canvas.umn.edu.

All Labs are due the Friday (11.55 p.m.) of the week **after** your scheduled Lab session. Late labs are docked by 1/3, and labs won't be accepted if they are more than 1 week late. Makeup labs are possible if the instructor has advance notice, so please anticipate conflicts, and contact the instructor. Labs are only accepted through the Canvas Course Site. **Labs are submitted as .pdf files**; please do not send .aprx, MSWord, or shapefiles. The final lab will have special requirements for submitting your work; this will be explained before the assignment.

Grading, Integrity, Ethics

Please note you may work together on labs, but you each must do every part of each lab and turn in entirely your own work. That means each of you should perform every step indicated in the lab manual. Your grade is for individual effort; copied files/maps from other students will be construed as cheating, at a minimum you'll get zero for the lab, and you may automatically fail the course.

We will try to grade labs in a one-week period, for quick turnaround. However, this won't happen in all cases. The four on-line exams will each be worth 7.39%; the FINAL will be worth 14.78%. Each lab and homework will be worth 2.46%, except the final lab, which is worth 4.93%. **Grading will be on a straight scale, not on a curve**. If you all do well, you will all get an A. The scale is:

A	90 – 100				
B+	88 – 89.99	B	82 - 87.99	B-	80 – 81.99
C+	78 – 79.99	C	67 - 77.99	C-	65 – 66.99
D+	63 – 64.99	D	50 - 62.9		

Class assignments are weighted as follows:

13 required labs = 34.48%, 2 required homework = 4.93%, 13 on-line quizzes = 6.4%, Semester Assignment = 9.85%,4 on-line exams = 29.56%, Final Exam = 14.78%); in addition, there are several opportunities to obtain extra credit (up to an additional 6.57% of the total course).

Note: during the class, when checking your grades on Canvas, please note the checkbox at the bottom of the "Assignments are weighted by group:" section; the check box "Calculate based only on the graded assignments" should be UNCHECKED to project your estimated FINAL Grade.