Department of Forest Resources
University of Minnesota
FNRM 3131- GIS for Natural Resources – Fall 2020 (*09/8/2020 – 12/16/2020)*

FNRM 3131 – Fully On-line class.
All materials for the class are contained in the assigned text and the Class Website; Our text was written by the Dr. Paul Bolstad specifically for this class and contains all conceptual material covered in the class. This text is the basis of all class quizzes and exams. Short videos and other material are on the class Website which support and clarify concepts in the text. The class laboratory assignments and homework are used to provide a direct application of GIS concepts using ArcGIS Software.

The class follows a weekly schedule of as shown on the Website. The Website is the primary source of all class materials. The class Canvas Site is used for submitting assignments, taking reading quizzes, exams and grades.

Instructors:

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Class Hours: On-Line; Instructors will be available via Zoom for questions and support:
Tuesdays 1:55 -2:45 p.m.
Wednesdays 8:30- 10:25 a.m., 12:50 – 2:45 p.m.
Thursday 9:35 – 11:30 a.m., 1:55 – 2:45 p.m.
Other hours can be arranged as needed; please call or email Andrew Jenks

Required Texts: *GIS Fundamentals: A First Textbook on Geographic Information Systems, Sixth Ed.*, Bolstad, Paul V., XanEdu Publishing, 2019. This book 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/fnrm3131.

Additional Resources: Most of you will use the lab software via an application called Citrix Desktop. Instructions on installation and virtual computer access are provided on the class website, http://giscourses.cfans.umn.edu/fnrm3131. While doing labs you should frequently save your work. You will be provided UMN class disk space, H:\ with instructions provided during the first week on how to access this space; use it to back up your work.

Student Responsibilities: You should access on-line class materials, do the readings, do assigned lab and homework problems submit them via Canvas; 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 3131 Schedule

NOTE: Readings are from the required textbook, *GIS Fundamentals; A First Textbook on Geographic Information Systems, Sixth Edition*, by Paul Bolstad.

Week	Class Topic --	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)	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	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	Thanksgiving (no classes)			
13	Cartographic modeling, flowcharts	**\L13:** Grouse Habitat Modeling	Chapter 13	
14	More cartographic modeling, dynamic spatial models, standards, data quality	**\L14:** Cartographic Modeling	Chapter 14	
15	New developments/future trends	Continue Lab 14 **Lab 14 due Fri., Friday**	Chapter 15	Exam 5 (comprehensive, but weighted, towards Chapters 12-14)
16	Finals Week			

Overview
FNRM 3131 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 the text.

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 should do the readings, understand the main concepts, and take the quiz before the end of Tuesday each week. You should review the practice exercises in the back of the assigned chapter(s) and compare your responses against those in the book appendix. These problems are similar to those in online exams, administered every two to four weeks. You will apply the concepts using ArcGIS each week through a lab exercise. You complete the exercises at home, using ArcGIS software. You should read the lab in advance, and review/note new procedures or activities.

Several options exist for access to the required ArcGIS software and data:

1. **Preferred/Recommended** - 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).
2. Install the UMN provided ArcGIS software directly on your Windows computer *(no MacOS option)* and download/unzip the lab data from the Class Website.

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** the lab was assigned. Late labs are docked by 1/3, and labs will not 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 is explained in the final lab instructions.

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 8.20% points; the FINAL will be worth 16.39%. Each lab and homework will be worth 2.73%, except the final lab, which is worth 5.46%. **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 = 38.26%, 2 required homework = 5.46%, 13 on-line quizzes = 7.1%, 4 on-line exams = 32.79%, Final Exam = 16.39%); in addition, there are several opportunities to obtain extra credit (up to an additional 7.29% of the total course. Note required material total to 100%, extra credit is additional and calculated separately.

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.

How EXTRA CREDIT is handled in the Grade Book

There are 4 Extra Credit opportunities: A 15-point Extra Credit Homework Quiz, a 15-point Extra Credit Lab, a 5-point Extra Credit GPS Lab and 5 possible points for "finding" Geocaches. These points COULD total up to 40 Extra Credit points. These 40 points amount to an extra 7.29% of the graded class assignments.

How this Works
Extra Credit (optional, extra credit opportunities): If all extra credit is completed, you would receive and EXTRA 7.29% of the regular class. Extra Credit is Awarded IN ADDITION to the regular class work.

Extra Credit will appear in the Student Grade Book throughout the class as 0% UNTIL the final grade calculation at the end of the class. (See the Grade Book Section "Assignments are weighted by group".) When the final grades are calculated we will enter "0" in all unsubmitted Extra Credit Assignments and change the Extra Credit Group percent (%) to 7.29%; So, at the very end of the class the TOTAL possible percent will display as 107.29%.

*If you do complete one or more Extra Credit Assignments during the class, your points will be recorded, as they are submitted & graded, and WILL SHOW up in the Grade Book but **WILL NOT be included in your Total % column** until the final grade calculation at the end of the class. If you wish to CALCULATE BY HAND the value of your Extra Credit work prior to the end of the class, do the following: take your graded Extra Credit Points and divide them by 40 and then multiply the result by 7.29. This calculation will allow you to predict the extra % that will be added to your total percent (as displayed in the Grade Book during the class). At the end of the class, we will do this same calculation in the grade book and improve your total percent position by whatever percent of Extra Credit you achieved*
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*For example, say you did 20 of the possible 40 extra credit points. (20/40) * 7.29 = 3.645*
3.645% would then be ADDED to your regular class work percentage at the final grade calculation.