

Department of Forest Resources
University of Minnesota
FNRM 3131- GIS for Natural Resources – Spring 2020 (01/21/2020 – 5/4/2020)¹.

FNRM 3131 **REVISED DUE TO UNIVERSITY ORDERS (3/18/2020)**

On-line Lecture & Labs (see Class [Website](#) for materials); All Sections

Instructors: Andrew C. Jenks Paul V. Bolstad
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Office Hours: No In-Person Office Hours

On- Line Office Hours Email (ajenks@umn.edu, phone (651-387-9600) or [Zoom](#)
I will try and keep the original hours open for [Zoom](#) or calls.
(Monday 4-8 pm; Tuesday 10:40 am-12:35 pm & 4-6 pm; Wed 12:50- 2:45 pm)

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/fnrm3131>.
You should do the readings before class meets; there is a quiz each week due Monday of 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/fnrm3131>. Throughout the labs sessions you will need to save/backup your work. You will be provided UMN class disk space, H:\, used it for your work.

Other Resources: The class website is <http://giscourses.cfans.umn.edu/fnrm3131>. This website has copies of this syllabus, and lab exercises. A related website, <http://paulbolstad.net/gisbook.html> has information on the textbook and errata.

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 3131 Schedule

NOTE: Readings are from the required textbook, [GIS Fundamentals: A First Textbook on Geographic Information Systems, Sixth Edition](#), by Paul Bolstad.

| Week | Lecture Topic -- Monday (or On-line) | Labs/Homework – Skok 35 (or On-Line) | Required Readings | On-Line Exams |
|------|---|---|---|---|
| 1 | No Lecture or Lab due to University holiday | No Labs this week | | |
| 2 | Course Introduction: Course mechanics Introduction to GIS, data models, data structures. | VL1: Intro. and practice with ArcGIS | Chapters 1 & 2 | |
| 3 | Geodesy, datums coordinate systems, map projections | VL2: Projections | Chapter 3 & ESRI PDF, Understanding Map Projections (skim) | |
| 4 | Maps, data entry & editing, metadata, map transformations | VL3: Digitizing | Chapter 4 | Exam 1 (Chapters 1,2,3) |
| 5 | GPS, begin aerial and satellite images | VL4: Map transformations; optional lab VL5: GPS (due March 27) | Chapters 5 & 6 up to 273 | |
| 6 | Continue aerial and satellite images, digital data, data sources, | VL6: Census, NWI, DEM data, basic table operations | Chapter 6 to end and Chapter 7, | Exam 2 (Chapters 4,5,6) |
| 7 | Introduction to Tables & relational databases | VL7: Tables | Chapter 8, up to pg. 357 | |
| 8 | No Classes - Spring Break (extended to 3/18/2020) | No Classes – Spring Break | | |
| 9 | Tables, normal forms | VL8: Table Import and Join Homework 1 due Friday | Chapter 8, pg. 358 to end | Exam 3 (Chapters 7 & 8) |
| 10 | Basic spatial analyses | VL9: Buffering, overlay | Chapter 9 | |
| 11 | Raster analysis | VL10: Raster Analysis Homework 2 due Friday | Chapter 10 | |
| 12 | Terrain analysis, more spatial analysis | VL11: Terrain and more spatial analysis | Chapter 11 | |
| 13 | Interpolation, prediction, core area delineation. | VL12: Interpolation | Chapter 12 | Exam 4 (Chapters 9, 10, & 11) |
| 14 | Cartographic modeling, flowcharts | VL13: Grouse Habitat Modeling | Chapter 13 | |
| 15 | More cartographic modeling, dynamic spatial models, standards, data quality | VL14: Cartographic Modeling | Chapter 14 | |
| 16 | New developments/future trends | Continue Lab 14 Lab 14 due Fri., Friday May 8, 11:59 p.m. | Chapter 15 | Exam 5 (comprehensive, weighted 1/3 towards Chapters 12-14) |

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 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 home. You should read the lab in advance, and review/note new procedures or activities.

1. 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 (11.59 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; zero (0) points will be assigned to labs more than 1 week late. Makeup labs or lab exceptions 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 within a one-week period, for quick turnaround. However, this won't happen in all cases. **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 (*note: there is no A- grade used in this class*):

| | | | | | |
|----|------------|---|------------|----|------------|
| 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 | | |

Grades are shown/reported on your [Canvas](#) grades tab.

The required class work (100%) is comprised of: 13 required labs = 38.26%, 2 required homework assignments = 5.46%, 13 on-line reading quizzes = 7.1%, 4 on-line exams = 32.79%, Final = 16.39%.

In addition to the required class work, there are several opportunities to obtain extra credit. These extra credit assignments, if completed, could add an additional 7.29% to your grade.

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*

*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.*