**Department of Forest Resources**
**University of Minnesota**
**FNRM 3131- GIS for Natural Resources – Spring 2017** (*01/16/2017 – 05/05/20176)*

FNRM 3131
In-Person Lecture: Monday: 4:05-6:00 p.m., Mondays, in 110 Green Hall, and one of the following:

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|---|---|---|---|---|
| 6:00 p.m. – | 8:00 p.m. | Monday | 35 Skok | Section 3 |
| 8:30 a.m. – | 10:25 a.m. | Tuesday | 35 Skok | Section 6 |
| 10:40 a.m. – | 12:35 p.m. | Tuesday | 35 Skok | Section 5 |
| 4:05 p.m. – | 6:00 p.m. | Tuesday | 35 Skok | Section 2 |
| 10:40 a.m. – | 12:35 p.m. | Wednesday | 35 Skok | Section 4 |

On-line Labs (come to any lab session as needed) Section7, 21
On-line Lecture (see Class Website) Section 20

**Instructor**: Andrew C. Jenks
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**Office Hours**: Mondays 2-4; 215 Green; *(* Google Hangouts, Wednesdays 8pm-9pm*)*

**Required Texts:** *GIS Fundamentals: A First Textbook on Geographic Information Systems, Fifth Ed.*, Bolstad, Paul V., XanEdu Publishing, 2016. 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 http://www.xanedu.com/higher-education/educators/custom-books-catalog/gis_fund_5e/ 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 prior to start of each Monday's 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/fnrm3131. Throughout the labs sessions you will need to save/backup your work. To do this **you should purchase at a portable USB drive to use in the lab**. As GIS files, can be quite large, you should get a 2 GB or larger drive.

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

**Student Responsibilities**: You should attend the lectures, do the readings, and do assigned homework problems. 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, Fifth Edition*, by Paul Bolstad. All classes start 2nd week.

| Week | Lecture Topic -- Monday *(or On-line)* | Labs/Homework – Skok 35 (*or On-Line)* | Required Readings | On-Line Exams |
|---|---|---|---|---|
| 1<br>Jan 16 | No Lecture or Lab due to University holiday | No Labs this week | | |
| 2<br>Jan 23 | Course Introduction: Course mechanics<br>Introduction to GIS, data models, data structures. | **\L1:** Intro. and practice with ArcGIS | Chapters 1 & 2 | |
| 3<br>Jan 30 | Geodesy, datums<br>coordinate systems, map projections | **\L2**: Projections | Chapter 3 &<br>ESRI PDF, Understanding Map Projections (skim) | |
| 4<br>Feb 6 | Maps, data entry & editing, metadata, map transformations | **\L3**: Digitizing | Chapter 4 | Exam 1<br>(Chapters 1,2,3) |
| 5<br>Feb 13 | GPS, begin aerial and satellite images | **\L4**: Map transformations;<br>optional lab **\L5:** GPS (due March 31) | Chapters 5 & 6 | |
| 6<br>Feb 20 | Continue aerial and satellite images,<br>digital data, data sources, | **\L6**: Census, NWI, DEM data, basic table operations | Chapter 7, | Exam 2<br>(Chapters 4,5,6) |
| 7<br>Feb 27 | Introduction to Tables &<br>relational databases | **\L7**: Tables | Chapter 8, up to pg. 356 | |
| 8<br>Mar 6 | Tables, normal forms | **\L8**: Table Import and Join<br>**Homework 1 due Friday** | Chapter 8, pg. 357 to end | |
| 9<br>Mar 13 | No Classes - Spring Break | No Classes – Spring Break | | |
| 10<br>Mar 20 | Basic spatial analyses | **\L9**: Buffering, overlay | Chapter 9 | Exam 3<br>(Chapters 7,8 & 9) |
| 11<br>Mar 27 | Raster analysis | **\L10**: Raster Analysis<br>**Homework 2 due Friday** | Chapter 10 | |
| 12<br>April 3 | Terrain analysis, more spatial analysis | **\L11**: Terrain and more spatial analysis | Chapter 11 | |
| 13<br>April 10 | Interpolation, prediction, core area delineation. | **\L12**: Interpolation | Chapter 12 | Exam 4<br>(Chapters 10, 11, & 12) |
| 14<br>April 17 | Cartographic modeling, flowcharts | **\L13**: Grouse Habitat Modeling | Chapter 13 | |
| 15<br>April 24 | More cartographic modeling, dynamic spatial models, standards, data quality | **\L14:** Cartographic Modeling | Chapter 14 | |
| 16<br>May 1 | New developments/future trends | Continue Lab 14<br>**Lab 14 due Fri., Friday May 5, 11:59 p.m.** | Chapter 15 | Exam 5<br>(comprehensive, weighted 1/3 towards Chapters 13-15) |

**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**

This course is offered both in-person and on-line. The course material is the same for all sections. You may attend the lectures in-person or on-line as you choose.

You may complete the exercises in labs 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 are open additional hours. Registered students will receive a 1 year copy of ArcGIS for use at home. Work at home requires copies of class data files, from the Skok 35 or Green 210 lab computers, or downloaded from the course website.

All Labs assignment will to be submitted via Moodle, http://www.myu.umn.edu/. Log in to www.myu.umn.edu, select "Academics" and then select the Moodle Course Link for FNRM 3131.

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 Moodle Course Site. Labs are submitted as .pdf files; please do not send .mdx, MSWord, or shapefiles *(unless directed by the instructor).* 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 45 points; the FINAL will be worth 90. Each lab and homework will be worth 15 points, except the final lab, which is worth 30 points. **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 | | |

Total required points in the class are: **549** (13 required labs = 210 points, 2 required homework = 30 points, 13 on-line quizzes = 39 points, 4 on-line exams = 180 points, Final = 90 points). In addition, there are several opportunities to obtain extra credit points.

Note: Grades are updated via the class Moodle site. As you turn in assignments or complete test/quizzes your total points will be updated. However, the percent "(%) of Couse total for FNRM 3131" reported on Moodle is calculated by the GRADES FOR THE WORK YOU HAVE SUBMITTED divided by the total of possible points for the ASSIGNMENTS YOU HAVE SUMBITTED.