"GIS for Nutrient and Energy Efficiency" – CRSS 4050 and 6050

Agricultural Applications of GIS for Nutrient and Energy Efficiency

COURSE SYLLABUS – Fall 2024

The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.

Course Title and ID: Improving Nutrient and Energy Efficiency with Geographic Information Systems, CRSS 4050 and 6050

Tuesdays 12:45 – 2:00 p.m. Reserve Thursdays 12:45 to 2:00 time to work on assignments.

COURSE DESCRIPTION: Students will apply GIS, GPS, and some remote sensing principles in agricultural applications; emphasizing hands-on experience working with producers, vendors, and researchers collecting data, developing spatial databases, analyzing data, and communicating findings. Students will explore agriculture as a landscape complex and evaluate factors (moisture, soil health, slope, soil classifications, location etc) to determine efficiency and/or conservation opportunities, and potentialities of applied technologies for improved management or use.

PREREQUISITES: CRSS 3030 or permission of instructor.

REQUIRED EQUIPMENT AND SUPPLIES: ArcGIS does not function well enough on Apple computers for the exercises we are doing in this class. Some labs will be on ELC as will data but most of the labs will require a workbook. Workbook will **not** be on elc. You are required to purchase the workbook for labs. Additional lab instructions will be on elc. The workbook is titled "GIS Tutorial for Arcgis PRO 3.1 by Wilpen L. Gorr and Kristen S. Kurland. I purchased mine through Amazon. I recommend buying the paperback copy as it has proven helpful for students in the past to have the "hardcopy" to read while doing the lab tutorials. We will complete the most of the workbook before the middle of the semester. After finishing the workbook and a few other lab exercises, you will work on your project during Thursday labs. When you buy the workbook complimentary software is available for 2 months and up to 180 days. Please "**Note**: Esri Press ebooks do not include 180-day trial software. Instead, you can download the ArcGIS Trial." If it is only 60 days I recommend downloading your free ArcGIS Desktop Advanced after you start working on your project.

We do have some data sets you may use for your project. But I expect you to capture some data on your own for use in your project. At a minimum a soil layer and associated attributes that fit into your project. A big part of this class is learning to access the data you need and making it usable in ArcGIS. I require all assignments and maps to be in meters and Universal Transverse Mercator (UTM) unless it is not applicable. Any map turned into me that is not will be deducted 5 points. There are very few acceptations.

All computers (In Athens, Griffin, and Tifton) **have been loaded with ArcGIS Pro 3.3. Anish Subedi is the TA for this class this semester for all locations**. Anish Subedi will be helping you in the lab as a TA. His email address is anish.subedi@uga.edu. Anish has had much experience with GIS but please know

that the software changes on a seasonal basis if not more often. This is a very evolving science and tool. Part of what you must learn is to make networks among your peers and be willing to ask questions and share all the updated nuances of the software. We have tested all of the lab assignments.

In Athens, computers with ArcGIS Pro 3.3x are on the first floor of the Miller Plant Sciences. There are 18 seats with the software in room Number is 1203. There are five seats in Griffin and five seats in Tifton. The computer technician in the computer lab are not versed in ESRI software but they will have to make any modifications that require the administer to do so. To get into the computer lab in Athens you must have your UGA ID.

In Tifton and Griffin, We will not have a TA this year on location at either location but Anish and I will come down to Tifton and Griffin to discuss your project, if needed or do one to one Zoom meeting and/or to share GPS to help with your projects depending on COVID best practices.

As proper Zoom behavior please keep your video on and your microphone open.

LESSON AND APPLICATION RESOURCES:

Getting to Know ArcGIS, fifth edition, updated for 10.6, Michael Law and Amy Collins
***GIS Tutorial, Basic Workbook*, Wilpen L. Gorr and Kristen S. Kurland**
The GIS 20 Essential Skills, Gina Clemmer
GIS Applications in Agriculture: Volume 2 Nutrient Management for Energy Efficiency, David Clay and John F. Shanahan
GIS Fundamental sixth edition, Paul Bolstad

COURSE OBJECTIVES:

1) To explore geographic information tools that can improve nutrient and energy efficiency and soil and water conservation in agricultural systems (from small community gardens to farm field, to state to national
2) To explore through geographic information tools methods of measuring and improving economic, societal, environmental, and other ecosystem services influencing sustainable and resilient agricultural systems (I consider forests urban or otherwise as agriculture;

This class is about you being creative, exploring a solution or understanding a problem, making a management decision and pressing the capacity of ArcGIS desktop or Arcgis Pro to do so. Beyond the workbook and the lab exercises we have prepared for you. What we explore exactly will depend on your needs, curiosity, and initiative.

TOPICAL OUTLINE (tentative):

1. Overview Getting to Know ArcGIS Pro for Desktop

2. GIS Components hardware and software

3. Analyzing spatial data, considerations and concerns

- Data models
- Geodesy, Datums, Projections and Coordinate systems

4. Maps, Data Entry, Editing and Output

5. Does the lay of the land matter? (scale)

6. Working with Geospatial and Digital data

- Understanding the importance of MetaData
- Collecting and using GPS data
- Integration of USDA-NRCS Web soil Survey and Site Collected Data
- Locating and downloading data from the internet

7. Attribute data and tables

8. Using historical management to reduce soil sampling errors

9. Assessing map quality

10. Using Tools in ArcGIS

11. Basic Spatial Analysis, Spatial auto corrélation, and modifiable areal unit problem

12. Energy and Climate Implications for Agriculture Nutrient use Efficiency

13. Nutrient management for Improved Energy Efficiency

14. Carbon, Nitrogen and Phosphorus assays for efficient nutrient management

15. Energy efficiency

16. Reports on Projects

Food and Drink in the Classroom

University policy prohibits tobacco products, food or drink in all labs and classrooms.

ACADEMIC HONESTY POLICY

All academic work must meet the standards contained in "A Culture of Honesty." Students are responsible for informing themselves about those standards before performing any academic work. See: http://www.uga.edu/honesty/

- The UGA Student Honor Code states: "I will be academically honest in all of my academic work and will not tolerate academic dishonesty of others."
- For this course, all lab reports and other assignments can be discussed with your classmates but any work you turn in must be your own.
- Plagiarism of online and other sources will not be tolerated. Any assignment that includes plagiarized materials will be assigned a grade of zero. A second infraction will result in referral to UGA's Office of Academic Honesty.

Definition of Plagiarism

(https://honesty.uga.edu/Academic-Honesty-Policy/Prohibited_Conduct/)

Submission for academic advancement the words, ideas, opinions or theories of another that are not common knowledge, without appropriate attribution to that other person. Plagiarism includes, but is not limited to, the following acts when performed without appropriate attribution:

- Directly quoting all or part of another person's written or spoken words without quotation marks, as appropriate to the discipline;
- Paraphrasing all or part of another person's written or spoken words without notes or documentation within the body of the work;
- Presenting an idea, theory or formula originated by another person as the original work of the person submitting that work;
- Repeating information, such as statistics or demographics, which is not common knowledge and which was originally compiled by another person;
- Purchasing (or receiving in any other manner) a term paper or other assignment that is the work of another person and submitting that term paper or other assignment as the student's own work.

ChatGPT and Similar Tools

ChatGPT, Google Bard, Anthropic Claude, OpenAI's GPT4, and similar tools may be used in class on a limited basis. How and when they can be used will be discussed prior to each assignment. You may not submit any work generated by an AI tool as your own. If you include material generated by an AI program, it should be cited like any other reference material.

INSTRUCTOR:

Dr. Dorcas H. Franklin - Room 3119 Miller Plant Sciences Bldg. 542-2449 or **706 340 4870**, dfrankln@uga.edu. Email or **text** are the recommended method for questions outside of class. TA Anish.subedi@uga.edu.

OFFICE HOURS: by appointment.

INSTRUCTION: There will be 1 lecture per week (1 hour and 15 minutes). The lecture will include information needed to produce accurate high-quality maps and landscape analysis to make sound agricultural and natural resource management decisions. There may be weekly quizzes which will be on materials covered in previous lectures or on assigned GIS work. You are expected to do assigned chapters in the computer lab on your own or in a group. Anish Subedi will be available 3 hours a week to help in Athens and through internet in Tifton. Maps created in class assignments should be put in word and submitted to me (dfrankln@uga.edu) and Anish Subedi by the next Wednesday 5pm (before the next lab).

GRADING:

Pop Quizzes	**5% (perhaps weekly)**
Weekly Assignment	**10%**
Exam	**20% (November 7 -9)**
GPS/GIS Midterm Project	**15% (Nov 16)**
Final Project presentation	**5% (November 21 & 26)**
Final Project	**45% (Dec 5)**

Not: There are several pieces to completion of the project and project timeline will be distributed in class.

POLICY FOR MAKE-UP OF EXAMINATIONS

Projects, exams and assignments may be made up with proper justification of the reasons why the student could not take them at the specified dates and times. Make-up exams may be administered as oral exams.

Final class grades will be based on the scale below.

Grades will be assigned using the following scale:	
94 to 100 %	**A**
90 through 93 %	**A-**
87 through 89 %	**B+**
83 through 86 %	**B**
80 through 82 %	**B-**
77 through 79 %	**C+**
73 through 76 %	**C**
70 through 72 %	**C-**
67 through 69 %	**D+**
60 through 66 %	**D**
Below 60 %	**Failure**