# **GIS IN SOIL & WATER SCIENCE**

SWS 4720C - Sections 8197,133A,133F,134B,134C - Fall 2015

**Instructor** 

Susan Curry scurry@ufl.edu 2163 McCarty Hall A Office Hours MTW, 10:00-11:59am or by appt. **Teaching Assistant** 

TBD

or by appt. ONLINE MEETINGS / CHATS: Thursday evening 6:00-7:00 pm EST approximately every other week.

Chat session attendance is not mandatory but responses to questions posed in the recorded chat session are part of you participation grade. Please have your microphone and camera working and turned on for each session.

# **COURSE OBJECTIVES:**

To provide students with the basic concepts of geographic information systems and applications focused on soil and water resource management. To familiarize the students with the ESRI ArcGIS 10.x software and provide guided practice. Students who finish this class should be able to:

- Explain what a GIS is and what it can do
- Work with and create GIS maps in ArcMap
- Access and query a GIS database
- Describe two common GIS data structures
- Explain what geographic data is, how it is made, and where to get it
- Explain what spatial analysis is and solve geographic problems using ArcGIS analysis tools
- List common GIS tasks and identify which ArcGIS Desktop application is used for each task
- Understand what the geodatabase offers for GIS data storage
- Create, edit, and add data to a geodatabase
- Control the appearance and display of data layers in ArcMap
- Change the coordinate system and map projection used to display a dataset
- Query and analyze GIS data
- Create presentation-quality maps and graphs

# **DELIVERY MODE:**

Course material is provided via **Canvas**: <u>http://lss.at.ufl.edu</u> (including annotated Power Point slides, reading material in pdf format, library of GIS video clips, quizzes, and hyperlinks)

Virtual computer lab is used for GIS assignments: <u>https://virtual.ifas.ufl.edu/</u> The virtual computer lab provides 24/7 access to the ArcGIS software package and spatial datasets that will be used for the assignments. Please logout after use to free that system for another user.

Note: You must logout (not close the window) of the virtual lab, and then log off from your computer if you have logged in on campus. Email is used for asynchronous communication.

Required textbook comes with software and license: A student may use the software on their own computers instead of the virtual lab. If this is your choice, no technical help for setup/debugging problems will be provided by the instructor.

#### **PREREQUISITES:**

Basic knowledge in Windows operating system and high-speed Internet access (e.g. DSL, cable modem, or satellite modem) and in geography, statistics, and soil science/land resources are expected.

#### **SOFTWARE:**

In this course the ArcGIS Vers. 10.x (Environmental Systems Research Institute, Redlands, CA) software is used including the components ArcCatalog, ArcMap, ArcToolbox and ArcEditor.

The following extensions will be used: Spatial Analyst and Geostatistical Analyst.

Other supporting software packages available in the virtual computer lab include: MS Office Suite-MS Word, Power Point, Excel and Access.

#### **REQUIRED TEXTBOOK:**

Gorr W. and Kristen Kurland. 2013. GIS Tutorial, Basic Workbook, 10.1. Fifth Edition. ESRI Press. Redlands, California. ISBN 978-1-58948-335-4

#### **RECOMMENDED READING:**

Bolstad P. 2008. GIS Fundamentals. Eider Press, White Bear Lake, Minnesota. ISBN 0-9717647-0-0 Chang, Kang-tsung. Introduction to Geographic Information Systems. McGraw Hill. Boston. MA. ISBN 978-0-352283-8

#### **OTHER RESOURCES:**

ESRI online forums and support YouTube Gis.stackexchange.com Google Earth

#### GRADING

Assignments	40%
2 Exams	20%
Quizzes	10%
Project (Group)	20%
Course participation - discussions/chats	10%
TOTAL	100%

Assignments are worth 20 to 50 points depending on difficulty. A grading rubric and additional instructions for submission will be provided with each assignment. Late assignments will be accepted for 4 days after the submission date and will lose 20% of the grade per day that they are late. After 4 days the assignment will no longer be accepted and the student will receive a zero for that assignment. Start your assignments early, technical difficulties seem to always occur the night before an assignment is due. Several of these assignments can take over 5 hours to complete. They are not hard but **they are time consuming**.

Study the learning material provided on the course web site and textbooks. The participation grade is based on active participation in class activities, workbook completion submissions, and postings on the discussion board. All hands-on assignments, the exam, and the GIS project have to be conducted within the virtual computer lab where output files are written to individual private student user folders (identified by their Gatorlink username). These files can be viewed by the instructor and TA and serve as proof that an assignment, exam, or project was conducted by a student enrolled in this course. The instructor and TA are available for questions as they arise. Students are encouraged to ask questions about the assignments and learning materials on the discussion board to be shared and viewable to everybody in class. The instructor or TA will post answers to questions within 48 hours (another reason to start assignments early). You may contact the instructor through Canvas email, UFL email or by phone (M-F). A response can be expected within 24 hours during the week and 48 hours on the weekends.

## **GRADING SCALE:**

А	B+	В	C+	С	D+	D	E
90-100	85-89	80-84	75-79	70-74	65-69	60-64	<60

#### **COURSE MODULES:**

Introduction: Course Mechanics. IFAS Virtual Lab.

## Module 1: Principles of Geographic Information Systems (GIS)

Introduction to the basic components and structure of GIS. Geographic concepts, definitions and data formats will be introduced. Introduction to the ArcGIS software and its components (ArcMap, ArcCatalog and ArcToolbox). Give examples of how a GIS can be used. List the components in a GIS.

## Module 2: Data Models

Common spatial data models (vector, raster and TIN) and map basics. We will discuss the differences between raster and vector formats and the advantages and disadvantages when using these different formats.

## Module 3: Geodatabases and Attribute data

In this module you will learn about database management of spatial data, attribute tables and metadata. You will learn what a geodatabase is and the benefits of organizing your data into a geodatabase. Introduction to relational databases, table operations and queries.

## Module 4: Map Projections

This module provides an overview of geographic coordinate systems and map projections. You will be introduced to basic geodesy, datums, coordinate systems, and map projections.

## Module 5: Data Sources and Entry

Introduce the students to the many type of digital data that are available through government agencies and online. Practice downloading and manipulating digital data for project use. In this module you will be introduced to digitizing data for GIS systems.

## Module 6: Basic Spatial Data Analysis

An overview of multiple vector-based and raster-based (local, focal, zonal and global) spatial operations will be provided. You will learn how to create new spatial datasets and how to edit existing spatial datasets. Examine some basic spatial analysis operations such as Clip, Intersect, and Union.

#### Module 7: Remote Sensing and Digital Data

In this module you will be introduced to the different methods of collecting/digitizing data for GIS systems such as GNSS, GPS, aerial and satellite images. Examine aerial photographs and satellite scans and their uses in GIS. Understand what orthographic images are and how they are developed.

#### Module 8: Topics in Raster Analysis

This module will introduce map algebra and local functions which can be used in a GIS analysis. Look at some basics for raster data analysis. Understand map algebra, local, neighborhood and zonal functions.

## Module 9: Project In this module you will work to develop a GIS project.

#### **ACADEMIC HONESTY:**

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: *"We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity."* You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment."* 

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <a href="http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code">http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code</a>.

## **CAMPUS HELP RESOURCES**

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, <u>www.counseling.ufl.edu/cwc/</u> Counseling Services, Groups and Workshops, Outreach and Consultation, Self-Help Library, Wellness Coaching

Career Resource Center, First Floor JWRU, 392-1601, www.crc.ufl.edu/

## Services for Students with Disabilities

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/

#### **SOFTWARE USE:**

All faculty, staff and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

#### **Online Course Evaluation Process**

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at <a href="https://evaluations.ufl.edu">https://evaluations.ufl.edu</a>. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at <a href="https://evaluations.ufl.edu/results">https://evaluations.ufl.edu/results</a>

# Topic Schedule – Deadlines and Due Dates (these may be adjusted as the semester progresses)

# ALL ASSIGNMENTS IN SWS 4720C ARE DUE AT 11:59 PM (EST) ON THE DUE DATE

COURSE MATERIAL	ΑςτιοΝ		TIME (EST)
	Action	DOLDAIL	(231)
INTRODUCTORY Video and Syllabus Quiz	Begin	Monday, August 24, 2015	9:00 A.M.
Syllabus FAQ Quiz (in Canvas)	Due	Monday, August 31, 2015	11:59 PM
Module 1 - Principles of Geographic Information Systems	Begin	Monday, August 24, 2015	9:00 A.M.
View Module 1 Lectures:			
Assignment 1: ESRI Getting Started	Due	Thursday, September 3, 2015	11:59 PM
Discussion Activity Module #1 - Your Response	Due	Friday, August 28, 2015	11:59 PM
Discussion Activity Module #1 - Respond to <b>at least</b> 2 other			
students	Due	Friday, September 4, 2015	11:59 PM
Complete <b>Quiz 1</b>	Due	Tuesday, September 8, 2015	11:59 PM
Module 2 – Data Models	Begin	Friday, September 4, 2015	9:00 A.M.
View Module 2 Lectures:			
Assignment 2: Florida Wetlands	Due	Thursday, September 17, 2015	11:59 PM
Discussion Activity Module #2 - Your Response	Due	Friday, September 11, 2015	11:59 PM
Discussion Activity Module #2 - Respond to <b>at least</b> 2 other			
students	Due	Friday, September 18, 2015	11:59 PM
Complete <b>Quiz 2</b>	Due	Monday, September 21, 2015	11:59 PM
Module 3 - Geodatabases and Attribute data	Begin	Friday, September 18, 2015	9:00 A.M.
View Module 3 Lectures:			
Assignment 3: Africa	Due	Thursday, October 1, 2015	11:59 PM
Discussion Activity Module #3 - Your Response	Due	Friday, September 25, 2015	11:59 PM
Discussion Activity Module #3 - Respond to <b>at least</b> 2 other			
students	Due	Friday, October 2, 2015	11:59 PM
Complete <b>Quiz 3</b>	Due	Monday, October 5, 2015	11:59 PM
Module 4 – Map Projections	Begin	Friday, October 2, 2015	9:00 A.M.
View Module 4 Lectures:			
Assignment 4: Map Projection	Due	Thursday, October 15, 2015	11:59 PM
Discussion Activity Module #4 - Your Response	Due	Friday, October 9, 2015	11:59 PM
Discussion Activity Module #4 - Respond to <b>at least</b> 2 other students	Due	Friday. October 16. 2015	11:59 PM
Complete <b>Quiz 4</b>	Due	Monday, October 19, 2015	11:59 PM
Test 1 - opens 10/22/2015			

COURSE MATERIAL	ACTION		TIME
Module 5 - Data Sources and Entry	Begin	Friday, October 16, 2015	9:00 A.M.
View Module 5 Lectures:			
Assignment 5: Digitizing Assignment	Due	Thursday, October 29, 2015	11:59 PM
Discussion Activity Module #5 - Your Response	Due	Friday, October 23, 2015	11:59 PM
Discussion Activity Module #5 - Respond to <b>at least</b> 2 other			
students	Due	Friday, October 30, 2015	11:59 PM
Complete <b>Quiz 5</b>	Due	Monday, November 2, 2015	11:59 PM
Module 6 - Basic Spatial Data Analysis	Begin	Friday, October 30, 2015	9:00 A.M.
View Module 6 Lectures:			
Assignment 6: Spatial Analysis	Due	Thursday, November 12, 2015	11:59 PM
Discussion Activity Module #6 - Your Response	Due	Friday, November 6, 2015	11:59 PM
Discussion Activity Module #6 - Respond to <b>at least</b> 2 other			
students	Due	Friday, November 13, 2015	11:59 PM
Complete <b>Quiz 6</b>	Due	Monday, November 16, 2015	11:59 PM
Module 7 - Remote Sensing and Digital Data	Begin	Friday, November 13, 2015	9:00 A.M.
View Module 7 Lectures:			
Assignment: Work on Project			
<b>Discussion</b> Activity Module #7 - Your Response	Due	Friday, November 20, 2015	11:59 PM
Discussion Activity Module #7 - Respond to <b>at least</b> 2 other			
students	Due	Tuesday, November 24, 2015	11:59 PM
Complete <b>Quiz 7</b>	Due	Monday, November 30, 2015	11:59 PM
Module 8 - Topics in Raster Analysis	Begin	Friday, November 20, 2015	9:00 A.M.
View Module 8 Lectures:			
Assignment 8: Raster Analysis	Due	Thursday, December 3, 2015	11:59 PM
<b>Discussion</b> Activity Module #8 - Your Response	Due	Friday, December 4, 2015	11:59 PM
Discussion Activity Module #8 - Respond to <b>at least</b> 2 other			
students	Due	Friday, December 11, 2015	11:59 PM
Complete <b>Quiz 8</b>	Due	Monday, December 7, 2015	11:59 PM
Test 2 – opens 12/12/2015			
	Duo	Turning December 1 2015	44-50 DM
Group Project Due	Due	Tuesday, December 1, 2015	11:59 PIVI