

# Course Syllabus

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## GIS 3043: Foundations of GIS

Welcome to GIS3043: Foundations of Geographic Information Systems! Read this Syllabus thoroughly, as well as all important course deadlines below. Refer to the Syllabus and [Start Here](#) section throughout the semester for any course-related questions. Should you have any complaints with your experience in this course please visit the [Student Complaint Process webpage \(http://www.distance.ufl.edu/student-complaints\)](http://www.distance.ufl.edu/student-complaints) to submit a complaint.

### Instructor: M. Anwar Sounny-Slitine

- Office: TUR 3131
- Office Hours: By Appointment (Generally available during working hours)
- Instructor's Phone/Text: 512-522-7090
- Instructor's Skype: anwarsounnyslitine
- Instructor's Gmail/GChat [sounny@gmail.com](mailto:sounny@gmail.com) (<mailto:sounny@gmail.com>)
- (<mailto:sounny@gmail.com>) Instructor's Facebook: <https://www.facebook.com/m.sounny> (<https://www.facebook.com/m.sounny>)
- Email: Use the Conversations (Inbox) tool within Canvas
- Course Website: <http://elearning.ufl.edu/> (<http://elearning.ufl.edu/>)
- Class Meeting Time & Location: This course is facilitated 100% online.

### Course Description

This course introduces basic theories and technologies of Geographic Information Systems (GIS), including the representation, acquisition, manipulation, analysis, and display of geographically related information. Hands-on experiences of GIS software are emphasized through lab-based applications.

### Prerequisites

This course is designed for students with no prior Geographic Information Systems experience. No prerequisites are needed.

### Textbook

"GIS Fundamentals: A first text on Geographic Information Systems" by Paul Bolstad, 5th Ed. (The book website: <http://www.paulbolstad.net/gisbook.html>) (<http://www.paulbolstad.net/gisbook.html>)%C2%A0)

### Course Conduct

You need to be aware that online learning can present significant challenges, particularly to individuals who are not self-starters or those who do not possess good time management skills. The online classroom is available to you 24 hours a day. Unlike traditional instructional settings in which each student gets the same class, the online setting means that every student gets a different class; the class of his or her choosing. In theory, this type of instruction should be more adaptable to a variety of learning styles. The reality is, however, that some students seem unwilling (we believe all are able) to create their own virtual classroom. This results in procrastination and low-quality performance.

Recognizing that everyone learns differently, I'm not going to prescribe the "best way" to approach the course. You should note, however, that this course is not self-paced. You are expected to adhere to the class calendar. Most assignments are due by 11:55 P.M. (EST) on the date specified in the Tentative Course Schedule.\*Assignments will not be accepted late.\* I do recognize that personal circumstances arise which may interfere with the student's ability to meet a deadline. If something does occur, communicate with myself or the course graduate assistant as soon as you are aware of a conflict. I will not be receptive to retrospective requests for extensions. Your emails will be responded to within 24 business hours (typically sooner). Anytime you have a question or problem, email immediately.

### Required Readings

You are responsible for the interpretations of any and all assigned readings. Not all reading materials will be covered in the course lectures. Read carefully and critically.

### Due Dates

All assignments and quizzes are due by 11:55 PM (EST) on the assigned date listed in the Tentative Course Schedule. No assignments will be accepted after the due date. You are advised to make back-up copies of all work and submit your work early to avoid technical problems.

### Academic Integrity/Student Honor Code

"The University of Florida requires all members of its community to be honest in all their endeavors. Students are required to commit themselves to academic honesty by signing a prescribed basic statement, including the Student Honor Code, as part of the registration process. "As a member of the UF community, students pledge on their honor to neither give nor receive unauthorized aid while working or completing assignments and examinations. "Any individual who becomes aware of a violation of the Student Honor Code is bound by honor to take corrective action." Violations of the UF Academic Honesty Guidelines will not be tolerated and violators will be treated in accordance with the UF Student Honor Code. To avoid misunderstandings on both our parts, please refer to the University of Florida Student Honor Code located at <http://www.dso.ufl.edu/SCCR/honorcodes/honorcode.php>.

### Commercial Sale of Course Lectures

The content presented in the class is the property of UF and may not be duplicated in any format without permission from the College of Health and Human Performance and UF, and may not be used for any commercial purposes. Students violating this policy may be subject to disciplinary action under the UF Conduct Code.

### Special Accommodations/ Students with Disabilities

Students requesting specific classroom accommodations must provide me with an accommodation letter from the Disability Resource Center (Dean of Students Office) by the end of the first week of classes verifying their eligibility and specifying their level of support. Students experiencing difficulty with the course readings, lectures, assignments, or examinations are encouraged to talk with me.

### U Matter, We Care

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

### Items Percentage

- Quizzes = 30 %
- Lab Assignments = 30 %
- Final project proposal = 15%
- Final project presentation = 25 %

### Grading Scale

- A = 93.00-100%
- A- = 90.0-92.9%
- B+ = 88.00-89.9%
- B = 83.5-87.9%
- B- = 80.0-83.4%
- C+ = 78.00-79.9%
- C = 73.5-77.9%
- C- = 70.0-73.4%
- D+ = 68-69.9%
- D = 60-67.9%
- E = Less than 60%

### **Grading Policy** *Grades will be determined based on your performance on the following activities*

- **Module Quizzes:** Each module of the 14 modules has a graded and timed quiz posted at the completion of the module. Each quiz is worth 100 points. The average of all quizzes accounts for 30% of the final grade. You will have 30-90 minutes to complete a quiz. All quizzes will be due on the dates listed in the Tentative Course Schedule at 11:55 PM (EST).
- **Lab assignments:** There are 11 lab exercises and each has an assignment that is worth 100 points. The average of all labs accounts for 30% of the final grade. There is no time limit to complete the labs, but all labs will be due on the dates listed in the Tentative Course Schedule at 11:55 PM (EST).
- **Project proposal:** Each student is required to develop a GIS project proposal covering any topic in their area of interest. The proposal is worth 100 points and accounts for 15% of the final grade. The proposal should reflect the fundamentals of GIS theory and technologies through the use of problem-solving and spatial thinking skills. The student should follow the guideline and PowerPoint template to complete the proposal. The proposal needs to be done individually (no group projects) and be submitted as a PowerPoint on the due date listed in the Tentative Course Schedule at 11:55 PM (EST).
- **Project presentation:** Each student is required to complete a GIS project based on their proposals, and then self-record a PowerPoint presentation video to submit. The project presentation is worth 100 points and accounts for 25% of the final grade. The student should follow the guideline and PowerPoint template to complete their presentation. The project and the presentation need to be done individually (no group projects) and be submitted as a video clip on the due date listed in the Tentative Course Schedule at 11:55 PM (EST).

### **Other Policies:**

You determine your grade based on the quality and frequency of your work. Consequently, your time management skills, time spent on assignments, and communication with your TA or me when you have questions or concerns regarding quizzes and assignments will impact your success or failure of this course. With this approach of grading on adherence to predetermined standards, there is no pre-conceived distribution of grades. Everyone or no one can receive an "A". I do not, have not, and will not round grades. Quiz feedback are provided to the student immediately following the due date. Students have three days to view quiz and exam feedback. Please allow FIVE business days from the due date for lab assignment/project proposal feedback. UF Grading Policies: Information on current UF grading policies for assigning grade points can be found at <http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>.

**Course Experience:**

Should you have any complaints with your experience in this course please visit <http://www.distance.ufl.edu/student-complaints> to submit a complaint.

**Course Assistance**

- If you have questions about course expectations or the grading procedures, or if you have difficulty with the course content, the readings, the lectures, the class activities, or the assignments, please see a course instructor immediately. Don't wait until it's too late.
- Be sure you have easy and reliable high speed Internet access.
- You cannot complete this online course with a dial-up connection.
- Keep up; it is easy to "ignore" online course requirements until it is too late.
- Plan to be online 5-7 times each week and schedule time to work on your course(s) in your day planner or calendar. Be sure to schedule a time in which you can work without interruptions.
- Use a word processor program when typing drafts of your discussion postings and responses. This will enable to you save your work in case of any unexpected technical glitches. It will also enable to you to use sophisticated spelling and grammar checkers.
- Strive to make assignments meaningful and relevant to your personal and professional goals.
- Life happens. I understand that during this semester, you may experience challenging personal or professional situations, which may take your attention away from this course. It is important that if you are experiencing difficulty in the class to communicate with me as soon as a difficulty occurs.

**Learning Outcomes / Course Objectives:** The course is organized into 14 Modules. The student should expect to spend approximately TWO hours viewing the lectures/readings that accompany each module, and another TWO hours completing lab session and assignment.

**Module 0 - Start**

Upon successful completion of this module, the student will be able to:

1. Describe course objectives.
2. Identify required activities of this course.
3. Describe grading policy of this course

**Module 1 - What is GIS?**

Upon successful completion of this module, the student will be able to:

1. Define geographic information, GIS, and GIScience.
2. Outlines the pulls and pushes for developing GIS
3. List and give examples for major components of GIS
4. Manage files under the virtual desktop interface (VDI)
5. Use rudimentary operations in ArcGIS

**Module 2 - GIS data models**

Upon successful completion of this module, the student will be able to:

1. Describe how geographic information is abstracted from human perception into digital formats
2. Identify different types of coordinates
3. Convert latitude/longitude between two formats
4. Identify different types of attributes
5. Design a table to organize attributes
6. Define vector data model and its associated spatial topology.
7. Define raster data model and the winner-take-all strategy
8. Compare the strengths and weakness of vector and raster data models
9. Use ArcCatalog to manage data in ArcGIS

**Module 3 - Measuring spatial location**

Upon successful completion of this module, the student will be able to:

1. Differentiate between real earth surface, geoid, and ellipsoid
2. Define horizontal datum, vertical datum, and their major components
3. Interpret a national geodetic survey report.
4. Describe a map projection in term of its project surface, relative position to ellipsoid, distortion types.
5. Identify major characteristics of Albert, Lambert, Transverse Mercator projections.
6. Identify major characteristics of UTM and find the UTM zone for any given region (e.g. a county)
7. Identify major characteristics of state plane and find the state plane zone for any given region (e.g. a county)
8. Define and project coordinate systems of GIS data in ArcGIS
9. Georeference data in ArcGIS

**Module 4 - Managing attributes in database**

Upon successful completion of this module, the student will be able to:

1. Define database and list its advantages over flat files
2. Identify four types of database models

3. Describe how GIS data are organized by database models
4. Define the concepts in relational databases, including entity, attributes, instance, keys.
5. Calculate the results of 4 basic relational database operations: union, intersect, join, and difference
6. Construct a complete SQL statement using the syntax
7. Define Metadata and provide examples of Metadata in GIS
8. Manipulate and query attribute tables in ArcGIS

### **Module 5 - Mapping spatial data**

Upon successful completion of this module, the student will be able to:

1. Create maps with existing spatial datasets in ArcGIS
2. Perform geocoding and spatial join in ArcGIS
3. Identify appropriate GIS data sources with different topics

### **Module 6 - GIS data production**

Upon successful completion of this module, the student will be able to:

1. Define digitizing and identify different types of digitizing processes.
2. Compare the three generic coordinate systems
3. Describe procedures for image georeferencing, including the setup of control points and the evaluation of transformation models.
4. Calculate RMSE to assess the quality of georeferencing.
5. Describe potential sources of errors in GIS data production and technologies to minimize these errors.
6. Differentiate between accuracy and precision.
7. Identify four types of accuracy assessments for GIS data.
8. Use ArcGIS to georeference an image
9. Use ArcGIS to digitize and edit spatial datasets

### **Module 7 - Introduction to GPS**

Upon successful completion of this module, the student will be able to:

1. List major components of GPS
2. Explain the working principle of GPS
3. Outline characteristics of 3+2 GPS signals
4. Identify sources of GPS measuring errors
5. Identify good and bad satellite constellations for GPS measurements
6. Describe the principle of post-processed and real-time differential corrections

### **Module 8 - Basis spatial analysis**

Upon successful completion of this module, the student will be able to:

1. Define spatial analysis and its three scales
2. Apply attribute and spatial selections on GIS datasets
3. Select and apply appropriate classification methods on GIS datasets
4. Apply buffer, near, Thiessen polygon analysis to vector datasets
5. Calculate the results from distance function on raster datasets
6. Calculate the results of overlay analysis for GIS datasets
7. Use ArcGIS to perform basic spatial analysis

### **Module 9 - Raster data analysis**

Upon successful completion of this module, the student will be able to:

1. Describe the premise of map algebra
2. Apply arithmetic, logic, Boolean operators and conditional function to raster layers
3. Calculate results from neighborhood statistics on raster layers
4. Calculate results from zonal statistics on raster layers
5. Apply cost distance function to raster
6. Use ArcGIS spatial analyst to perform basic raster analysis
7. Use ArcGIS to organize raster data

### **Module 10 - Terrain analysis**

Upon successful completion of this module, the student will be able to:

1. Identify multiple digital representations for terrain
2. Apply slope analysis on terrain data
3. Apply aspect analysis of terrain data
4. Parameterize shaded relief analysis
5. Describe the purpose of viewshed analysis and identify its applications in real practice
6. Describe the purpose of hydrologic analysis and its basic assumption
7. Calculate results from hydrologic functions on terrain data

**Module 11 - GIS modeling**

Upon successful completion of this module, the student will be able to:

1. Define model and explain why 'all models are wrong but some are useful'.
2. identify characteristics of cartographic models
3. Identify characteristics of simple spatial models
4. Identify characteristics of spatiotemporal models
5. Use ArcGIS model builder
6. Synthesize all ArcGIS skills to implement a GIS model.
7. Design a GIS model using a flowchart.

**Module 12 -Spatial interpolation**

Upon successful completion of this module, the student will be able to:
















1. Identify the purpose of spatial interpolation and the underlying assumption of it.
2. Identify 4 types of sampling strategies and their respective characteristics
3. Apply the nearest neighbor and moving average interpolation.
4. Apply the IDW interpolation with different exponents.
5. Apply the trend surface interpolation.
6. Evaluate the accuracy of interpolation.















**Module13 - Introduction to Remote sensing**

Upon successful completion of this module, the student will be able to:

1. Define remote sensing and describe its advantages in GIS data collection.
2. Identify characteristic reflectance curves for different geographic features.
3. Explain why the near-infrared band is widely used to display vegetation
4. Describe working principle of remote sensing
5. Differentiate between spatial, temporal and spectral resolutions of remotely sensed images
6. List 4 keys we can use to identify geographic features during aerial photo interpretation
7. Choose between aerial photos and satellite images to fit specific needs.

**Course Summary:**

Date	Details	
Mon Jan 15, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415927">Module 0 Syllabus Quiz (https://ufl.instructure.com/courses/346484/assignments/3415927)</a>	due by 11:59pm
Tue Jan 23, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415916">Lab 1: Lab Setup (https://ufl.instructure.com/courses/346484/assignments/3415916)</a>	due by 11:55pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415917">Module 1 Lecture Quiz (https://ufl.instructure.com/courses/346484/assignments/3415917)</a>	due by 11:55pm
Mon Feb 5, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415912">Lab 2: Learning ArcGIS Data and File Structures (https://ufl.instructure.com/courses/346484/assignments/3415912)</a>	due by 11:55pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415914">Module 2 Lecture Quiz (https://ufl.instructure.com/courses/346484/assignments/3415914)</a>	due by 11:55pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415928">Module 3 Lecture Quiz (https://ufl.instructure.com/courses/346484/assignments/3415928)</a>	due by 11:55pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415933">Lab 3: Coordinate Systems and Map Projections (https://ufl.instructure.com/courses/346484/assignments/3415933)</a>	due by 11:59pm
Mon Feb 12, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415910">Lab 4: ArcGIS File, Geodatabase, and Database Operations (https://ufl.instructure.com/courses/346484/assignments/3415910)</a>	due by 11:55pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415934">Module 4 Lecture Quiz (https://ufl.instructure.com/courses/346484/assignments/3415934)</a>	due by 11:55pm
Mon Feb 19, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415909">Lab 5a: Creating Maps Using Census Data (https://ufl.instructure.com/courses/346484/assignments/3415909)</a>	due by 11:55pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415923">Module 5 Lecture Quiz (https://ufl.instructure.com/courses/346484/assignments/3415923)</a>	due by 11:55pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415929">Lab 5b: Geocoding Households in Alachua County (https://ufl.instructure.com/courses/346484/assignments/3415929)</a>	due by 11:59pm
Mon Feb 26, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415930">Module 6 Lecture Quiz (https://ufl.instructure.com/courses/346484/assignments/3415930)</a>	due by 11:55pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415932">Lab 6: Georeferencing UF campus image (https://ufl.instructure.com/courses/346484/assignments/3415932)</a>	due by 11:59pm
Mon Mar 5, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415918">Lab 7: Heads Up Digitizing (https://ufl.instructure.com/courses/346484/assignments/3415918)</a>	due by 11:55pm

Date	Details	
Fri Mar 9, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415924">Module 7 Lecture Quiz (https://ufl.instructure.com/courses/346484/assignments/3415924)</a>	due by 3:10pm
Mon Mar 19, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415921">Lab 8: Vector Analysis (https://ufl.instructure.com/courses/346484/assignments/3415921)</a>	due by 11:59pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415931">Module 8 Lecture Quiz (https://ufl.instructure.com/courses/346484/assignments/3415931)</a>	due by 11:59pm
Mon Mar 26, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415915">Module 9 Lecture Quiz (https://ufl.instructure.com/courses/346484/assignments/3415915)</a>	due by 11:55pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415925">Lab 9: Crime Scene Investigation (https://ufl.instructure.com/courses/346484/assignments/3415925)</a>	due by 11:59pm
Mon Apr 2, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415922">Lab 10: GIS model builder (https://ufl.instructure.com/courses/346484/assignments/3415922)</a>	due by 11:59pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415919">Module 10 Lecture Quiz (https://ufl.instructure.com/courses/346484/assignments/3415919)</a>	due by 11:59pm
Mon Apr 9, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415937">Final Project Proposal (https://ufl.instructure.com/courses/346484/assignments/3415937)</a>	due by 11:59pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415926">Lab 11: Campsite Selection (https://ufl.instructure.com/courses/346484/assignments/3415926)</a>	due by 11:59pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415920">Module 11 Lecture Quiz (https://ufl.instructure.com/courses/346484/assignments/3415920)</a>	due by 11:59pm
Mon Apr 16, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415913">Module 12 Lecture Quiz (https://ufl.instructure.com/courses/346484/assignments/3415913)</a>	due by 11:59pm
Mon Apr 23, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415911">Module 13 Lecture Quiz (https://ufl.instructure.com/courses/346484/assignments/3415911)</a>	due by 11:59pm
Wed May 2, 2018	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415936">Final Project (https://ufl.instructure.com/courses/346484/assignments/3415936)</a>	due by 11:59pm
	 <a href="https://ufl.instructure.com/courses/346484/assignments/3415935">Course Feedback Survey (https://ufl.instructure.com/courses/346484/assignments/3415935)</a>	