

# GIS 510: Syllabus

– **FALL 2018**

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## TAs for the course:

TA Name	Email
Sabina Bastias	<a href="mailto:sbastia@ncsu.edu">sbastia@ncsu.edu</a>
Christopher Franz	<a href="mailto:ctfranz@ncsu.edu">ctfranz@ncsu.edu</a>
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## Course Description:

This course provides an advanced overview of how geographic information systems [GIS] facilitate data analysis and communication to address common geographic problems. Students improve spatial reasoning and problem definition expertise while emphasizing geographic data models and structures, data manipulation and storage, customization through programming, and the integration of geospatial analysis and modeling into project-based problem solving applicable to a variety of disciplines. Skilled application of both desktop and cloud-based GIS software supports these areas. Extensive independent learning and computer experiences include virtual laboratory sessions, alongside optional online or in-person weekly help sessions to facilitate student learning.

While there are Internet (001) and Distance Education (DE)- Internet (601) sections of GIS 510, all sections of these classes will operate exclusively in the online format.

## Learning Goals and Objectives:

The course is designed to advance student expertise in spatial reasoning, problem definition, and skilled application of GIS software and applications. Students will develop proficiency in the use of GIS from both a problem formulation and a problem solution perspective. Upon completion of the course the successful student will be able to:

- Define a geospatial problem and use fundamental concepts to solve a problem
- Identify and acquire geospatial data from numerous sources
- Efficiently perform basic and advanced operations in ArcGIS software
- Employ open-source GIS and cloud-based GIS techniques
- Independently identify and use the most appropriate spatial analysis techniques for a given problem
- Produce effective maps and other displays of spatial data
- Conceive and implement an original GIS project
- Effectively integrate literature reviews into proposal development

## Educational Approach:

Experiential learning is emphasized through a series of lectures, readings and Esri Web Course tutorials followed by application exercises. The overall design of the course is based on individual student exploration and practice. Students are in charge of their own learning and can

devote as much (or as little) time as they need to complete assignments. If you are struggling with any concept or task, please attend an in-person or online help session provided by the TAs.

This course will require the use of ArcGIS software, which students may install on their personal computer or access in campus computer labs. Eleven (11) Esri ArcGIS Web Courses (delivered from the [Esri training site](#)) will function as the textbook for the class. These web courses, along with readings and recorded lectures will support your completion of Assignments, the Midterm and the Final Project.

**Prerequisites:**

GIS 280, Senior Standing, or Graduate Standing.

**Additional Prerequisites:**

Most of the material covered in this class is either directly or indirectly delivered online. Therefore, it is assumed that each student is already proficient in web browsing using a Windows-based computing environment. Please review the document called [Your Computer Proficiency](#) at the top of the Main Moodle page to ensure you have the general computing skill set necessary for this course. General NC State computing information is also available on line from the NC State Office of Information Technology web site.

**Required and Optional Materials:**

1. Moodle. Material for this course will be delivered and returned through Moodle.
2. Esri e-Learning Web Courses. Students at NC State University can take any Esri web course for free because we purchase Esri qualifying products with a current maintenance subscription. You will create an account username and password for this account. Cost: FREE.
3. ArcGIS Online (AGOL) Utilities. The instructor will create this account for you using a predetermined user ID that may or may not be the same as your Unity ID. You will finalize this account by choosing your own password. This account will also be enabled so that you may access the web courses using this single account. Cost: FREE.
4. **ArcGIS Desktop** Geographic Information System Suite (ArcGIS Desktop 10.5.1). Cost: FREE
  - Option 1: The software is available in unity labs & on lab PCs in Jordan & Biltmore Halls.
  - Option 2: Download the software onto a personal computer that is running a windows operating system. A document called [ArcGIS Desktop Software Access Options](#) can be found at the top of the Main Moodle page on Moodle. Highlights include:
    - How to install ArcGIS, which is made freely available for download to all students, faculty and staff by the university, on your personal computer.
      - Visit the NCSU Software website (<http://software.ncsu.edu>), select ArcGIS Desktop, choose version 10.5.1 and follow the "Installation Instructions" link for downloading and installing ArcGIS Desktop 10.5.1 and setting the license server.
    - ArcGIS is available under a concurrent license agreement, which means that the program must touch a license server in order for the software to function.
      - If you are working from any off-campus location, you will need to install and use the NC State **Virtual Private Network** (VPN) client:  
<http://oit.ncsu.edu/data-network/ncsu-ssl-vpn-instructions>
    - ArcGIS software will not run directly on Apple computers. If you have a Mac please review the [ArcGIS Desktop Software Access Options](#) document discussing your options, which can be found at the top of the Main Moodle page.

- Neither the demonstration version of ArcGIS nor the student version that accompanies many ArcGIS textbooks is sufficient for this course.

5. **QGIS**. This open source Desktop Geographic Information System is available on lab PCs in Jordan & Biltmore Halls and it can be downloaded freely onto PCs and Macs. Cost: FREE

6. Storage Media. Each student working in computer labs should have at least one USB flash drive to use for assignments. We also highly recommend that each student select a way to back up course work (e.g. extra flash drive, the cloud, etc.)

7. Textbook (optional): *Getting to Know ArcGIS Desktop*, Environmental Systems Research Institute, Fourth (Esri Press), ISBN: 978-1589483828, available from Esri and other on-line book sellers. Please NOTE: software that may be included with the book does not include all modules or applications required for this course. You will need access to the full ArcGIS suite (ArcGIS Desktop 10.5.1). Cost: ~\$45.00-\$89.00; E-book ~\$38.00-\$65.00

### **Class Schedule & Delivery:**

A tentative schedule for the semester can be found at the end of this document. Moodle is your primary resource for course delivery and the most current schedule can be found there. At the top of the Main Moodle page, you will find the link to the lectures on MyMediasites as well as the class discussion board. Below that, the Main Moodle page displays weekly blocks each with Topics, Readings, Esri Web Courses, Assignment/Midterm/Project Descriptions and data as well as Assignment/ Midterm/ Project Submission Portals.

### **Optional Help Sessions:**

Multiple face-to-face, in-lab assistance sessions are available for any student who prefers a more traditional learning environment and can make it to campus. Additionally, there will be one online Google Hang Out help session each week. These help sessions meet on a regular weekly schedule during the semester. See the document called [Help Session Information](#) at the top of the Main Moodle page.

### **Communication & Forums:**

Three forums will be used for communication:

- Announcements
- Installation and Access Support Forum
- Class Discussion Board

Each student is force subscribed to the Announcements and Class Discussion Board forums, meaning you will get an email in your NCSU inbox for every posting. There will be an announcement made near the beginning of the semester with tips for managing these emails. If you do not use this account, you will need to set up forwarding of your e-mail to your preferred address. If you do not receive emails of the posts, you can contact the NC State Help Desk (<http://help.ncsu.edu>). You can view the posts in the forum at any time, without subscribing, by going to the Main Moodle Page.

This course heavily relies on written communication and effective communication is expected when posting to the forums or corresponding with the instructor or TAs. Keep your postings simple, clear, well punctuated and in complete sentences to make your message easier to read and more likely to get a quick response. DO NOT POST ASSIGNMENT ANSWERS (incorrect or otherwise) on the Class Discussion Board. See the document called [Assignment Instructions](#) at the top of the Main Moodle page for a discussion of appropriate Class Discussion Board

usage. The teaching staff aims to provide responses within 24 hours. Turnaround time is often much quicker. However, if you post a question within 12 hours of a submission deadline, you should not expect an answer before the deadline. Please do not be offended if answers seem brief. With around 100 students, we field a lot of questions! If you do not understand an answer, feel free to ask again.

Message board rants will not be tolerated. Do not put anything in a message that you would not say in a face-to-face meeting. Electronic communication is not an opportunity to be rude or bullying.

Email the instructor and TA directly only if your question or problem is more personal (e.g. family emergency) or if posting to the class discussion board would share an assignment answer (correct or otherwise)- See the academic integrity section below.

**Academic Integrity:**

Professional student conduct is expected throughout the course. It is assumed that the NC State Student Honor Pledge applies to all of this course's assignments (i.e., "I have neither given nor received unauthorized aid on this test or assignment.").

Read the NCSU policy overview (<https://studentconduct.dasa.ncsu.edu/code/>) and Sections 8 and 9 of the Code of Student Conduct (<https://policies.ncsu.edu/policy/pol-11-35-01>) and the following instructions:

Students are required to do the assignments and midterms individually. Study groups may discuss concepts; course readings videos or slides; the course website; and Esri Web Courses (not the module quizzes). Working on assignments together or any form of copying will not be tolerated. The work you submit must be your own.

Examples of cheating are: looking at another student's homework solutions, completing your homework while talking to someone else about it, talking another student through the homework solution, allowing others to look at your homework solutions, obtaining solutions from a student who is taking 510 or took GIS 510 during a previous semester.

Pay special attention to what you post on the message board. Before you post to the message board, ask yourself if what you are posting is 1) allowing other students to know your homework/midterm solutions (correct or otherwise) or 2) trying to elicit responses from other students that will walk you through a solution. If the answer to either is yes, please do not post to the message board, as this would be a breach of academic integrity. Rather, please direct your question in an email to both your TA and instructor. If you have any doubts about whether your post is permissible on the Message Board, ask the instructor.

Permitting your academic work to be used by another student is expressly prohibited. Review what constitutes cheating under the Code of Student Conduct (<https://policies.ncsu.edu/policy/pol-11-35-01>; Section 8.2). Any student found to be in violation of these guidelines will receive a zero on the assignment in question and a Report of an Academic Integrity Violation (RAIV) will be filed with the Office of Student Conduct (<https://policies.ncsu.edu/regulation/reg-11-35-02>; Section 5). A subsequent violation will result in a failing grade for the course and an additional report to the Office of Student Conduct for further action as prescribed by university regulations.

**Late submission policy:**

The eleven (11) assignments in this course are typically due at 8 pm EST on Friday. **No credit will be given for late Assignment submissions; however, at the end of the semester your lowest total assignment grade will be dropped.** Once all assignments and final project grades have been entered into Moodle, this data will be downloaded and a python script will be run to add all parts of an assignment together (quiz and layout - always worth 100 points) and drop the lowest grade (pop command). You may request that your TA provides feedback for any files submitted after the deadline, provided you notify your TA of your submission. You will not have access to the assignment quizzes as they close automatically at the due date and time.

Submission of the Midterm and three Final Project deliverables must be made on-time for full credit. Late penalties increase with each 24-hour period past the deadline. For example, *Final Project Part 3: Project Results* is due on a Monday. The following penalties will be applied within the Moodle rubrics:

- Submitted between 11:06pm Monday and 11:05pm Tuesday - 10% penalty
- Submitted between 11:06pm Tuesday and 11:05pm Wednesday - 20% penalty
- Submitted between 11:06pm Wednesday and 11:05pm Thursday - 40% penalty
- Submitted between 11:06pm Thursday and 11:05pm Friday - 80% penalty
- Any submissions after Friday at 11:05pm will result in no points awarded.

**Extension without penalty:**

Extension without penalty requests must be submitted to your TA and Instructor at least 24 hours in advance of the due date and time. Exceptions to the late submission policy will be granted for Assignment, Midterm, or Final Project Deliverable ONLY for the following conditions:

1. Severe illness documented by a verifiable physician (documentation required)
2. Verifiable personal or family emergency (documentation required)
3. Official NCSU excuse (see <https://policies.ncsu.edu/regulation/reg-02-20-03>; documentation required)

**Student Evaluation:**

Assignment Type	Points
Assignment 1-11	1000 (59%) (1100 points before drop)
Evolution of GIS Methodology 1-4	150 (9%)
Midterm	100 (6%)
Final Project Online Share	50 (3%)
Final Project Peer Feedback	30 (2%)
Final Project	370 (22%)
<b>Total</b>	<b>1700</b>

\* Grade percentages presented in the Moodle Grade Book are grade projections based on completed assignments. To determine your true percentage, you may divide the points you have earned out of the total possible points.

**Grading Scale:**

- > 98.00% = A+    > 87.00% = B+    > 77.00% = C+    > 67.00% = D+    <= 60% = F /No Credit  
 > 93.00% = A    > 83.00% = B    > 73.00% = C    > 63.00% = D  
 > 90.00% = A-    > 80.00% = B-    > 70.00% = C-    > 60.00% = D-

**Audits and Credit Only:**

GIS 510 may not be taken for credit only as that is a violation of the policies of the Graduate School. GIS 510 may be audited, with successful audits resulting from a student completing all 11 Assignments and the Midterm with at least a 70% average, without dropping the lowest Assignment grade. The Four-Part EvoGIS Project and Three-Part Final Project are not required.

**“Withdrawal” and “Incomplete” Polices:**

Any student who enrolls, but does not either complete the coursework or process a withdrawal form before the end of the University’s official drop period for the semester will receive a 0, unless they initiate one of the following options:

- A. The student is passing and officially drops the course after six weeks. In this case the student will be given a “W”. Passing this course is defined as having earned an average grade in the course of a 1.0 or above on the date of the student’s request for the “W”. This option will only be available in keeping with the current NCSU policy.
- B. The student receives an “I”. This grade will be given only in special documented circumstances when a student, for some serious reason, cannot complete the course by the required deadline. An “I” will be given only if the student has completed at least 80% of the course. An “I” cannot be used to simply avoid a 0 grade. All work to complete the course must be finished by the end of the next semester or the “I” will be changed to a 0 grade. This option will only be available in keeping with the current NCSU policy.

**Withdrawal for Behavior that Interferes with the Instructional Process:**

Interactions in this class are expected to be professional and courteous. Disruptive behavior, which impedes the teaching/learning process for other students, will not be tolerated. An instructor may withdraw a student for disruptive behavior that is interfering with the instructional process (such as students using portable phones or radios, or harassing faculty or other students on forums or in person). For further information see “Students Rights, Responsibilities, and Conduct” in the NCSU catalog. Please make sure you fully understand this agreement as you will be held to the entire policy as stated above.

**Additional GIS Classes:**

If you plan to take more advanced GIS classes, please note that the graduate course, GIS 510, is a prerequisite for the GIS applications course (GIS 520, Advanced Geospatial Analytics), the principles course (GIS 530, Principles of Geographic Information Science) and the programming course (GIS 540, Geospatial Programming Fundamentals). It is recommended for the modeling course (GIS / MEA 582, Geospatial Modeling and Analysis). See the CGA web site (<http://geospatial.ncsu.edu/education/courses/>) for further information on courses.

**Students with Special Needs:**

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653. For more information on NC State's policy on working with students with disabilities, please see the <http://dso.dasa.ncsu.edu/>

**Class evaluations online:**

Online class evaluations (<https://classeval.ncsu.edu>) will be available for students to complete during the last week of class. Students will receive an email message directing them to a website where they can login using their Unity ID and complete evaluations. All evaluations are confidential; instructors will never know how any one student responded to any question, and students will never know the ratings for any particular instructors. For additional information write to the student help desk: [classeval@ncsu.edu](mailto:classeval@ncsu.edu)

Course timeline (see Moodle for the most current timeline) – all times given in EST:

Week/ Date	Topic	Esri Course	Tasks
1 Aug 20	<ul style="list-style-type: none"> <li>Course Overview</li> <li>What is GIS and who uses it?</li> <li>Overview of GIS Software, Applications &amp; Extensions</li> <li>Data Formats, File Types &amp; Metadata</li> <li>Getting Stated with ArcMap</li> </ul>	<a href="#">Getting Started with GIS</a> (3.5 hours)	<b>Assignment 1: The World of GIS, Data to be created by the class</b> Available: Wednesday, Aug 22 <b>Due 8:00 p.m. Friday, Aug 31</b>
2 Aug 27	<ul style="list-style-type: none"> <li>Selections</li> <li>Factors to consider when making a map</li> <li>Map layouts, symbology &amp; scale</li> </ul>	<a href="#">Map Design Fundamentals</a> (2 hours)	<b>Assignment 2: Presenting Data in ArcMap, Schenck Forest Data</b> Available: Wednesday, Aug 29 <b>Due 8:00 PM Friday, Sept 7</b>  <b>EvoGIS Part 1: Research Foundation</b> <b>Due 11:00PM Sunday Sept 9</b>
3 Sept 3 (9/3 Labor Day)	<ul style="list-style-type: none"> <li>Projection &amp; Coordinate Systems</li> <li>The "Define Projection Tool" vs the "Project Tool" in ArcGIS</li> <li>Guest Lecture: <i>ArcGIS Error Handling</i> by Jason Matney</li> <li>Spatial Data Foundations: Teaser for GIS 530</li> </ul>	<a href="#">Referencing Data to Real-World Locations Using ArcGIS</a> (3.25 hours)	<b>Assignment 3: Projection Done Right, NCSU Campus Data</b> Available: Wednesday, Sept 5 <b>Due 8:00 PM Friday, Sept 14</b>
4 Sept 10	<ul style="list-style-type: none"> <li>Spatial Problem Solving w/ GIS</li> <li>The Basics of Geoprocessing (e.g. Intersections, Buffers, Clips, &amp; Dissolves)</li> <li>Procedure Logs</li> <li>Exporting Selections</li> <li>Introduction to Model Builder</li> </ul>	<a href="#">Solving Spatial Problems Using ArcGIS</a> (2.25 hours)	<b>Assignment 4: Spatial Problem Solving, Schenck Forest Data</b> Available: Wednesday, Sept 12 <b>Due 8:00 PM Friday, Sept 21</b>  <b>EvoGIS Part 2: Knowledge Pyramid</b> <b>Due 11:00 PM Sunday Sept 23</b>
5 Sept 17	<ul style="list-style-type: none"> <li>Geoprocessing Continued</li> <li>Joins and Relates</li> <li>Network Analyst</li> <li>Exporting models as python scrip's Geospatial</li> <li>Programing Fundamentals: Teaser for GIS 540</li> </ul>	<a href="#">Building Models for GIS Analysis Using ArcGIS</a> (3.75 hours)	<b>Assignment 5: The Spatial Database Advantage, Cell Phone Tower Data</b> Available: Wednesday, Sept 19 <b>Due 8:00 PM Friday, Sept 28</b>
6 Sept 24	<ul style="list-style-type: none"> <li>Midterm Project (Data Provided)</li> <li>Map Packages</li> </ul>	<a href="#">Creating and Sharing Map Packages in ArcGIS</a> (4 hours)	<b>Midterm: Archeology Dig, Gettysburg NP Data</b> Available: Wednesday, Sept 26 <b>Due 11:00 PM Wednesday Oct 3</b>
7 Oct 1 (10/4-5 Fall	<ul style="list-style-type: none"> <li>Spatial Databases</li> <li>Esri Geodatabases</li> <li>Topology</li> <li>Geospatial Data Structures &amp;</li> </ul>	<a href="#">Getting Started with the Geodatabases</a>	<b>Assignment 6: Creating &amp; Editing Data, NCSU Campus Data</b> Available: Wednesday, Oct 3 <b>Due 8:00 PM Friday, Oct 12</b>

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Break)	Web Services: Teaser for GIS 550	<a href="#">e</a> (4 hours)	<b>EvoGIS Part 3: Proposal</b> <b>Due 11:00 PM Sunday Oct 14</b>
8 Oct 8	<ul style="list-style-type: none"> <li>• Web Map Making</li> <li>• Picking a final project</li> <li>• Guest Lecture: Spatial Data Sources by Jeff Essic, NCSU Data Services Librarian</li> </ul>	<a href="#">Creating and Sharing GIS Content using ArcGIS Online</a> (2.5 hours)	<b>Assignment 7: Web Maps/Apps &amp; Final Project Planning: Ideas</b> Available: Wednesday, Oct 10 <b>Due 8:00 PM Friday, Oct 19</b>
9 Oct 15	<ul style="list-style-type: none"> <li>• Remote Sensing</li> <li>• Working with raster data</li> </ul>	<a href="#">Basics of Raster Data</a> (3.5 hours)	<b>Assignment 8: Working with Rasters, National Land Cover Data</b> Available: Wednesday, Oct 17 <b>Due 8:00 PM Friday, Oct 26</b>  <b>EvoGIS Part 4: Proposal Review</b> <b>Due 11:00 PM Sunday Oct 28</b>
10 Oct 22	<ul style="list-style-type: none"> <li>• Spatial Statistics &amp; Patterns</li> <li>• ArcGIS Spatial Statistics Tools</li> <li>• Hot Spot Analysis</li> <li>• Animating Data in ArcGIS</li> </ul>	<a href="#">Exploring Spatial Patterns in your Data using ArcGIS</a> (3.5 hours)	<b>Assignment 9: Geostatistics, Dengue Fever Data &amp; Final Project Planning: Data</b> Available: Wednesday, Oct 24 <b>Due 8:00 PM Friday, Nov 2</b>
11 Oct 29	<ul style="list-style-type: none"> <li>• Spatial Statistics</li> <li>• Interpolation</li> <li>• ArcGIS Spatial Analyst &amp; Geostatistical Analyst Tools</li> <li>• Geospatial Modeling &amp; Analysis: Teaser for GIS 582</li> </ul>	<a href="#">Performing Spatial Interpolation using ArcGIS</a> (2.25 hours)	<b>Assignment 10: Spatial Interpolation, Jockey's Ridge data</b> Available: Wednesday, Oct 31 <b>Due 8:00 PM Friday, Nov 9</b>
12 Nov 5	<ul style="list-style-type: none"> <li>• Geocoding</li> <li>• Working with Zip Code Data</li> <li>• Geoprocessing techniques reviewed</li> <li>• Final Project</li> </ul>	<a href="#">Address Geocoding with ArcGIS</a> (2.75 hours)	<b>Assignment 11: Location Precision, Habitat for Humanity Data</b> Available: Wednesday, Nov 7 <b>Due 8:00 PM Friday, Nov 16</b>
13 Nov 12	<ul style="list-style-type: none"> <li>• Providing constructive feedback</li> <li>• Mapping Pitfalls</li> <li>• Sharing proposed final project</li> </ul>		<b>Final Project Part 1: Online Share</b> <b>Due 11:00 PM Tuesday, Nov 20</b>
14 Nov 19 (11/21-23 Thanksgi ving)			<b>Final Project Part 2: Peer Feedback</b> <b>Due 11:00 PM Wednesday, Nov 28</b>
15 Nov 26			<b>Work on Final Project</b>
16 Dec 3			<b>Final Project Part 3: Project Results</b> <b>Due 11:00 PM. Friday Dec 7</b>