

# GEOG 6125/8125/INES 8090

GEOGRAPHIC INFORMATION SCIENCE AND TECHNOLOGY

Fall 2021

## Instructor Information

### Instructor

Dr. Elizabeth Delmelle

### Email

[edelmell@uncc.edu](mailto:edelmell@uncc.edu)

### Office Location & Hours

Virtually Tuesdays 9:00am EST or  
by appointment

Robert Gooljar

[rgooljar@uncc.edu](mailto:rgooljar@uncc.edu)

By appointment only

## Course Description

This course is intended to introduce students to the discipline of Geographic Information Science and Technology including fundamental theories, current debates and developments, and applications. A laboratory portion of the course will provide students with hands-on exercises that illustrate these concepts using a variety of software platforms. The intent of the course is not to train students in the use of a particular software, but rather to use software to demonstrate key concepts.

## Learning Outcomes

- Understand how spatial data are represented and stored within GIS.
- Understand map projections and coordinate systems, and to be able to select appropriate projections and align spatial data.
- Understand fundamentals of attribute data and to be able to perform spatial and non-spatial queries on data.
- Take a geographic problem and put together appropriate the analytical steps to solve the problem.
- Understand the limits and uncertainty inherent in GIS analyses and models.

## Course Evaluation

| Item               | Points               | Total |
|--------------------|----------------------|-------|
| Reading Discussion | 3 Points Each (*10)  | 30    |
| Lab Exercises      | 10 Points Each (*13) | 130   |
| Weekly Quizzes     | 3 Points Each (*13)  | 39    |
| Final Assignment   | 30 Points            | 30    |

## Reading Discussions

A series of weekly readings will be provided to help you in understanding and appreciating some of the history, fundamentals, and current topics/debates in the world of GIScience. To facilitate a discussion around these articles, we will be using the app called FlipGrid that is integrated into Canvas. A discussion leader will be responsible for initiating a series of questions\conversation starters related to the selected articles. This will be posted in video format by Monday of the assigned week. Then, each student must post a response to either the initial set of questions or to another student's response. All students must respond by video by the end of the week. For resources on leading an effective discussion, see:

<https://teachingcommons.stanford.edu/resources/teaching/student-teacher-communication/designing-effective-discussion-questions>.

Students should sign up for their discussion topic by the end of the first week. Multiple students will be assigned the same topic – you may either work together or just create separate prompts for the class to respond to. As discussion leader, you should provide a brief summary of the main points of the articles and then raise questions for the class to respond to. As respondents, you may respond to a particular question/add to the discussion on the main points/and also raise additional questions. Keep the conversation going!

### ***Weekly Quizzes***

There will be a series of short quizzes related to the weekly lecture/reading material to ensure that you are all comprehending and adequately engaging with the course material. These will be available on Canvas and are fully open notes/etc.

### ***Lab Exercises and Lab Information***

This is a 4-credit course including a weekly lab component. Your lab instructor/TA Robert ([rgooljar@unc.edu](mailto:rgooljar@unc.edu)) will be handling all things lab. Please do not direct lab questions to your main instructor! Robert will be there to assist you in working through the assignments during the designated lab period. If you opt not to attend the in-person session for whatever reason, please be respectful of his time when seeking assistance.

There are two **in-person** lab sections on Monday – you are signed up for one and must attend that one. There are strict capacity limits on the classrooms due to COVID. All assignments will use ArcGIS Pro which is available in the labs. Alternately, from home, there is access to the Apporto site for accessing the software (video demo on Canvas for using it). Lab exercises will be assigned on the Monday during lab time and will be due (unless otherwise noted) by the same week's Friday at 5PM. If you need virtual help outside of our lab meetings, questions may need to be addressed via screenshare (you must have a working microphone and camera). Feel free to ask questions at any time via email, and Robert will get back to you as soon as possible (response times may vary but are normally answered the same day). Please do not email hours before the lab is due with questions. Lab submissions must be turned in via Canvas by the assigned time or a late penalty of -10% will incur for each day late without prior arrangements/proof of circumstances. There are 13 weekly labs, each worth 10 points.

### ***Final Project***

In lieu of exams, there will be an assigned final project where you will put together some of the skills covered this semester. This will be assigned the final week of the semester and due during our designated final exam period.

### **Course Logistics**

This is a 4-credit 'hybrid' course. The lecture portion of the class is asynchronous and online. For this, each Monday morning, a new module for the week will be opened containing lecture videos, a low-stakes quiz to make sure the lecture material sunk in, and for most weeks, a reading assignment and virtual discussion. The quiz and discussion will be due by the end of the working day (5pm EST) Friday – so pace yourself!

For the lab, there are two different sections to accommodate COVID-spacing requirements in the lab space. The TA, Robert, will run and largely manage the lab components of the class. There should be ample time to complete the weekly lab during the designated lab session.

## Communication\Office Hours

I will hold regular virtual office hours each Tuesday at 9:00am EST. There is a zoom link on Canvas. If I am meeting with another student, you'll just hang out in the waiting room! If this does not work for you, simply send me an email to arrange another time. I am happy to respond by email to you, but just allow for 24 hours for a response. Thank You!

## Course Schedule

| <b>Week</b>           | <b>Topic</b>                     | <b>Due by Friday 5pm</b>  |
|-----------------------|----------------------------------|---|
| <b>Week 1: 8/23</b>   | Intro to GIScience               | 2 Flipgrid response (1) Getting to know you (2) Wayfinding challenge<br>Sign up for Discussion Leader Topic     |
| <b>Week 2: 8/30</b>   | Intro to GISystems               | <a href="#">Reading 1 Response</a><br><a href="#">Lab 1: Getting to Know ArcPro</a><br><a href="#">Quiz 1</a>   |
| <b>Week 3: 9/7</b>    | Vector Data Model                | <a href="#">Lab 2: Creating a File Geodatabase</a><br><a href="#">Quiz 2</a>                                    |
| <b>Week 4: 9/13</b>   | Raster Data Model                | <a href="#">Reading 2 Response</a><br><a href="#">Lab 3: Exploring Spatial Data</a><br><a href="#">Quiz 3</a>   |
| <b>Week 5: 9/20</b>   | Projections & Coordinate Systems | <a href="#">Reading 3 Response</a><br><a href="#">Lab 4: Working with Projections</a><br><a href="#">Quiz 4</a> |
| <b>Week 6: 9/27</b>   | Attribute Data & Queries         | <a href="#">Reading 4 Response</a><br><a href="#">Lab 5: Queries</a><br><a href="#">Quiz 5</a>                  |
| <b>Week 7: 10/4</b>   | Vector Analysis                  | <a href="#">Reading 5 Response</a><br><a href="#">Lab 6: Vector Analysis</a><br><a href="#">Quiz 6</a>          |
| <b>Week 8: 10/11</b>  | Raster Analysis                  | <a href="#">Reading 6 Response</a><br><a href="#">Lab 7: Raster Analysis</a><br><a href="#">Quiz 7</a>          |
| <b>Week 9: 10/18</b>  | Hydrologic Analysis              | <a href="#">Lab 8: Hydrologic Analysis</a><br><a href="#">Quiz 8</a>  |
| <b>Week 10: 10/25</b> | Geocoding & Networks             | <a href="#">Reading 7 Response</a><br><a href="#">Lab 9: Network Analysis</a><br><a href="#">Quiz 9</a>         |

| Week           | Topic                         | Due by Friday 5pm  |
|----------------|-------------------------------|--|
| Week 11: 11/1  | Terrain Analysis              | Reading 8 Response<br>Lab 10: Terrain Analysis<br>Quiz 10      |
| Week 12: 11/8  | Spatial Interpolation         | Reading 9 Response<br>Lab 11: Spatial Interpolation<br>Quiz 11 |
| Week 13: 11/15 | Suitability Analysis          | Reading 10 Response<br>Lab 12: Suitability Analysis<br>Quiz 12 |
| Week 14: 11/22 | <i>Thanksgiving Week</i>      |  |
| Week 15: 11/29 | Improving Map Design          | Lab 13: Map Design<br>Quiz 13                                  |
| Week 16: 12/6  | Introduction to Final Project |  |

## Academic Integrity

All students are required to read and abide by the Code of Student Academic Integrity. Violations of the Code of Student Academic Integrity, including plagiarism, will result in disciplinary action as provided in the Code. Definitions and examples of plagiarism are set forth in the Code and on the [Student Conduct and Academic Integrity website](#). The Code is available from the Dean of Students Office or online at [legal.uncc.edu/policies/up-407](http://legal.uncc.edu/policies/up-407). Additional resources are available on the [Student Conduct and Academic Integrity website](#).

*Turn in only work that is your own!*

The standards and requirements set forth in this syllabus may be modified at any time by the course instructor. Notice of such changes will be by email/Canvas announcement or by changes to this syllabus posted on the Canvas course page.

## COVID Info:

It is the current policy of UNC Charlotte that as a condition of on-campus enrollment, all students are required to engage in safe behaviors to avoid the spread of COVID-19 in the 49er community. Such behaviors specifically include the requirement that all students properly wear CDC-compliant face coverings [in all indoor spaces on campus](#), including classrooms and labs, **regardless of vaccination status**. Failure to comply with this policy in the classroom or lab may result in dismissal from the current class session. If the student refuses to leave the classroom or lab after being dismissed, the student may be referred to the Office of Student Conduct and Academic Integrity for charges under the [Code of Student Responsibility](#).

If you are absent from lab as a result of a COVID-19 diagnosis or quarantine, please contact the TA to arrange for your lab to be completed at home using the Apporto Software.  
The final decision for approval of all absences and missed work is determined by the instructor.

## Readings

### ***Defining GIScience***

- a) Mark, D.M. Geographic Information Science: Defining the Field
- b) Goodchild, M. (2018) Reimagining the history of GIS. *Annals of GIS*

### ***Data Models***

- a) Couclelis (1992) People manipulate objects (but cultivate fields): beyond the raster-vector debate in GIS. *Theories and Methods of Spatio-Temporal Reasoning in Geographic Space*.
- b) Nelson, G. D. (2019). Mosaic and tapestry: Metaphors as geographical concept generators. *Progress in Human Geography*, 43(5), 853-870.

### ***3. Map Projections***

- a) Battersby, S. E., Finn, M. P., Usery, E. L., & Yamamoto, K. H. (2014). Implications of web Mercator and its use in online mapping. *Cartographica: The International Journal for Geographic Information and Geovisualization*, 49(2), 85-101.
- b) Lapon, L., De Maeyer, P., Vanhaeren, N., Battersby, S., & Ooms, K. (2019). Evaluating young people's area Estimation of countries and continents. *ISPRS International Journal of Geo-Information*, 8(3), 125.

### ***4. Qualitative GIS***

- a) Mennis, J., Mason, M. J., & Cao, Y. (2013). Qualitative GIS and the visualization of narrative activity space data. *International Journal of Geographical Information Science*, 27(2), 267-291.
- b) Giordano, A., Cole, T. (2018) The limits of GIS: Towards a GIS of place. *Transactions in GIS*

### ***5. Scale***

- a) Ruddell, D. and Wentz, E. (2009) Multi-tasking: Scale in Geography. *Geography Compass*
- b) Goodchild, M. (2011) Scale in GIS: An overview. *Geomorphology*

### ***6. Raster Applications***

- a) Cruzan, M. B., Weinstein, B. G., Grasty, M. R., Kohn, B. F., Hendrickson, E. C., Arredondo, T. M., & Thompson, P. G. (2016). Small unmanned aerial vehicles (micro-UAVs, drones) in plant ecology. *Applications in plant sciences*, 4(9), 1600041.
- b) Mulrooney, T., Beratan, K., McGinn, C., & Branch, B. (2017). A comparison of raster-based travel time surfaces against vector-based network calculations as applied in the study of rural food deserts. *Applied Geography*, 78, 12-21.

### ***7. Geocoding & Confidentiality***

a) Curtis, A. J., Mills, J. W., & Leitner, M. (2006). Spatial confidentiality and GIS: re-engineering mortality locations from published maps about Hurricane Katrina. *International Journal of Health Geographics*

b) Zandbergen, P. (2009) Geocoding quality and implications for spatial analysis. *Geography Compass*.

### **8. Uncertainty**

a) Goodchild, M. (2018) A GIScience Perspective on the uncertainty of context. *Annals of the American Association of Geographers*

b) Kwan, M-P (2018) The limits of the neighborhood effect: Contextual uncertainties in geographic, environmental health, and social science research. *Annals of the American Association of Geographers*

### **9. Reproducibility**

a) Nust and Pebesma (2020) Practical Reproducibility in Geography and Geosciences. *Annals of the American Association of Geographers*

### **10. The future?**

a) Gahegan (2020) Fourth paradigm GIScience? Prospects for automated discovery and explanation from data. *International Journal of Geographical Information Science*