

## **GEOG 541**

### Geographic Information Systems in Public Health

Spring 2023 Mondays 3:35-6:35pm

Classroom: Peabody Hall Room 2024

Instructor: Michael Emch

Email: [emch@unc.edu](mailto:emch@unc.edu)

Office hours: Mondays 2:15-3:15 pm or by appointment

Office: Carolina Hall 304 or Carolina Population Center room 2147 (always book in advance via email and I will tell you which office) [Directions to the Carolina Population Center](#)

Teaching Assistant: Cyrus Sinai

Email: [sinai@unc.edu](mailto:sinai@unc.edu)

Office hours: Tuesdays 10-11 am, Wednesdays 4-5 pm, or by appointment.

Office hours meeting room: Carolina Hall 304

Please use this link to schedule office hour

meetings: <https://calendly.com/csinai/geog541officehours>

### **Course Objectives**

GEOG 541 is a course covering the theory and application of geographic information systems (GIS) in public health. The course includes an overview of the principles of GIS in health studies and practical experience in its use. The practical component involves the use of desktop GIS software packages including [ArcGIS](#) and other spatial analysis software including GeoDa and SaTScan. Other packages will also be discussed including QGIS and R. Both the theoretical and practical components of the course are important. Without a theoretical understanding of GIS methods, you will make bad geographic modeling decisions and when necessary, you will not be able to migrate to a new or different software package. Without a practical understanding of GIS software your theoretical knowledge cannot be put to use. A large component of this class will be devoted to students working on an individual project in which you implement a health study with a spatial component using GIS applications.

### **Required Text and Other Readings**

Cromley, E. K., & McLafferty, S. L. (2012). GIS and Public Health (2nd edition). New York: Guilford Press. Available at the UNC Student Stores, Amazon, etc. Additional readings are on Sakai.

### **Class Activities, Reading Reflections, and Exercises**

This is a seminar and thus it is designed to be interactive; it is not a lecture class. Class time will be comprised of different activities including discussions of readings and working in groups on exercises. Each week you will write a reflection of the readings of the week. Each reading reflection will consist of a typed, single-spaced document between ½ to 1 page long describing the 3-5 most useful things you learned from the materials for that week. Submit the reading reflections on Sakai Assignments for a particular week **before** class and be ready to discuss the material.

## **Discussion Lead**

All students will help lead the class discussion for one class period during the semester. Three or four students will be assigned to each class period. The discussion leaders will give a short presentation summarizing the material for the day at the beginning of the class (about 20 minutes). This is simply to get us started as everyone will have read the material and handed in a reading reflection for the day. The discussion leaders will organize the rest of the class period by developing 3-4 discussion questions. The instructor will supplement the discussion leaders' questions with additional discussion questions. The point of the discussion is to have the class think more deeply about the materials that all students should have read before the class period. Discussion leaders are welcome to do something more innovative and spend some of the time having students do short exercises or work in small groups for very specific tasks for short periods of time and report back to the larger class. The entire discussion will be around half the class period (~1 ½ hours). The discussion leaders for the day should coordinate with one another.

## **Practical Component and Final Project**

The practical exercises are GIS exercises that you will do on computers mostly outside of class time. They provide a way to acquire skills using GIS software packages and to apply the course concepts to real data. The project is intended to provide a deeper understanding of a GIS application through experience. You should acquire spatial data and the project should involve some type of spatial analysis. The UNC GIS librarian will visit our class early in the semester and talk about the [resources available](#) including help with spatial data acquisition and software help. The deliverable is a Powerpoint presentation that you present to class members and you will create an MP4 file of your presentation- see instructions on Sakai. You should use the knowledge and skills you acquired in the class discussion, books, papers, and practical component of the course. Every project must include the following sections: Introduction, Data, Methods, Results, and Discussion. The introduction should situate your project within the theoretical context that you learned about in this class.

## **Grading**

*Practical Exercises 20%*

Grade divided equally between the three Practical Exercises.

*Final Project and Presentation 25%*

*Reading reflections 20%*

You get a completion grade for handing in each reading reflection. If you hand in a typed, single-spaced document before the deadline that is between ½ to 1 page then you will receive 10 points out of 10 for each reading reflection. If the reflection is incomplete, then you'll get less than 10 points for a given reading reflection.

*Class Exercises 30%*

There are two parts to this grade. Half of the grade is a completion grade, divided equally, for handing in all parts of each exercise. If you hand in all parts then you will receive 10 points out of 10 for each exercise. If an exercise is incomplete, then you'll get less than 10 points for that exercise. At the end of the semester all of the exercises are combined to serve as a portfolio for

the different parts of your class project which count towards the other half of the grade. The exercises sequentially build on each other towards the completion of your final project. Since there is no paper in this class, only a presentation, this serves as a portfolio of the details of your project.

*Discussion lead 5%*

Grade based on Powerpoint slides, presentation, and facilitation of discussion.

**Attendance**

Attendance is taken via UNC Check-in. Please check in using the app each day- [unccheckin.unc.edu/](http://unccheckin.unc.edu/). If you miss class, whether excused or unexcused, you must complete a makeup assignment that is described in the document called Makeup Assignment on Sakai under Resources. Please email the TA before class saying that you will be absent.

**Assignment Submission and Late Assignments**

Submit all assignments via Sakai Assignments. It's important that you keep up with the material so you can actively take part in the class discussions and classroom group exercises which build on previous exercises and readings. You must therefore hand in the assignments including the reading reflections on time. If you hand in deliverables late, including reading reflections, then 10% will be deducted each week they are late. All deliverables must be uploaded to Sakai before class the date they are due; the time that each item is uploaded is logged on the instructor Sakai account. It is also important that all students hand in all assignments and for each assignment that you do not hand in, whether it is a reading reflection, exercise, or make up assignment 5% will be deducted from your final grade. The final project must be handed in to successfully complete the course. There is thus a lot of incentive to hand in all assignments in this class.

**Schedule**

Week: Dates	Topics, Materials, and Activities
Week 1: Jan 9	<p><b>Course Introduction</b></p> <p><u>Activities</u></p> <p>Ice breaker and meet class members Goals of the class and introduction Create class discussion lead schedule Intro to Practical Exercise 1 ArcGIS virtual lab software demo</p> <p><u>Materials</u></p> <p>Read the course syllabus in detail and explore the course Sakai site</p>
No class Jan 16 MLK Day	<p><b>Introduction to GIS in Public Health</b></p> <p><u>Materials</u></p> <p>C&amp;M Introduction and Chapter 1</p>
Week 2: Jan 23	<p>Discussion Lead: Mike</p>

	<p><u>Activities</u> Class Exercise 1</p> <p><u>Deliverables</u> Week 2 reading reflection</p>
Week 3: Jan 30	<p><b>Spatial Data</b> <u>Materials</u> C&amp;M Chapter 2 O'Sullivan and Unwin Chapter 1</p> <p>Discussion Lead: Francois Daudelin, Reagan Smith, Arhys Cruz Mora, Sadie Amato</p> <p><u>Activities</u> Class Exercise 1 GIS Librarian Session</p> <p><u>Deliverables</u> Week 3 reading reflection</p>
Week 4: Feb 6	<p><b>Spatial Databases for Public Health</b> <u>Materials</u> C&amp;M Chapter 3 Ali et al. 2001</p> <p>Discussion Lead: Kai Larson, Lily Fishman, Megan Sussman, Nicholas Payst</p> <p><u>Activities</u> Class Exercise 1</p> <p><u>Deliverables</u> Week 4 reading reflection</p>
<p>No class Feb 13 Well-being Day</p> <p>Week 5: Feb 20</p>	<p><b>Mapping Health Information</b> <u>Materials</u> C&amp;M Chapter 4 Koch Chapter 1</p> <p>Discussion Lead: Olivia Peters, Sarah Haight, Ike Bryant, Colin Anderson</p> <p><u>Activities</u> Class Exercise 2</p> <p><u>Deliverables</u> Week 5 reading reflection Class Exercise 1</p>

<p>Week 6: Feb 27</p>	<p><b>Analyzing Spatial Clustering of Health Events</b></p> <p><u>Materials</u>  C&amp;M Chapter 5  Sabel and Loytonen (2004)  Omer et al. (2008)</p> <p>Discussion Lead: Julia Kaplan, Rebecca Noga, Salma Ali, Macayla Jackson</p> <p><u>Activities</u>  Class Exercise 2  Intro to Practical Exercise 2</p> <p><u>Deliverables</u>  Week 6 reading reflection  Practical Exercise 1</p>
<p>Week 7: Mar 6</p>	<p><b>Analyzing Environmental Hazards</b></p> <p><u>Materials</u>  C&amp;M Chapter 6  Chakraborty et al. 2011</p> <p>Discussion Lead: Grace Bell, Connor Bassett, Jenny De Groot, Cameron Holmes</p> <p><u>Activities</u>  Class Exercise 3</p> <p><u>Deliverables</u>  Week 7 reading reflection</p>
<p>Spring Break  Mar 13</p> <p>Week 8: Mar 20</p>	<p><b>Analyzing the Risk and Spread of Infectious Diseases</b></p> <p><u>Materials</u>  C&amp;M Chapter 7  Janko et al. 2018 (bed nets)</p> <p>Discussion Lead: Joline Hartheimer, Kristen Cowan, Anneliese Long, Madeline Vessey</p> <p><u>Activities</u>  Class Exercise 3</p> <p><u>Deliverables</u>  Week 8 reading reflection  Class Exercise 2</p>

<p>Week 9: Mar 27</p>	<p><b>Infectious Diseases: Context in Nationally Representative Surveys</b>  <u>Materials</u>  Messina et al. (2011)  Janko et al. 2018 (agriculture)</p> <p>Discussion Lead: Ilianna Rodgers, Will Rutledge, Mia Hall, Daisy Butzer</p> <p><u>Activities</u>  Class Exercise 4</p> <p><u>Deliverables</u>  Week 9 reading reflection</p>
<p>Week 10: Apr 3</p>	<p><b>Spatial Regression</b>  <u>Materials</u>  Sparks and Sparks 2010  Emch et al. 2006</p> <p>Discussion Lead: Lois Johnson, Kieran Fitzmaurice, Cherrel Manley, Matt Dunn</p> <p><u>Activities</u>  Class Exercise 4  Intro to Practical Exercise 3</p> <p><u>Deliverables</u>  Week 10 reading reflection  Class Exercise 3  Practical Exercise 2</p>
<p>Week 11: Apr 10</p>	<p><b>Exploring the Ecology of Vector-borne Diseases</b>  <u>Materials</u>  C&amp;M Chapter 8  Messina et al. 2016</p> <p>Discussion Lead: Katherine (Kay) Tyrlik, Hannah Mitchell, Harry Lambert, Alex Hubbs</p> <p><u>Activities</u>  Class Exercise 4</p> <p><u>Deliverables</u>  Week 11 reading reflection</p>

<p>Week 12: Apr 17</p>	<p><b>Analyzing Access to Health Services and Locating Health Services</b>  <u>Materials</u>  C&amp;M Chapters 9 and 10  Delamater et al. 2013</p> <p>Discussion Lead: Mackenzie Douglas, Sarah Montague, Sophia Sload, David Bodden</p> <p><u>Activities</u>  Class Exercise 5</p> <p><u>Deliverables</u>  Week 12 reading reflection  Class Exercise 4</p>
<p>Week 13: Apr 24</p>	<p><b>Neighborhoods &amp; Health and Health Disparities</b>  <u>Materials</u>  C&amp;M Chapter 11  Brandt et al. 2021  DiezRoux 2001</p> <p>Discussion Lead: Drew Keener, Casey Meisel, Sam Neally, Tavon Cates</p> <p><u>Activities</u>  Class Exercise 6</p> <p><u>Deliverables</u>  Week 13 reading reflection  Practical Exercise 3  Class Exercise 5</p>
<p>Exam Time:  May 2 4-7pm</p>	<p><b>Final project presentations</b></p> <p><u>Activities and Deliverables</u>  Project Presentation. See instructions on Sakai.</p>

**Title IX**

Any student who is impacted by discrimination, harassment, interpersonal (relationship) violence, sexual violence, sexual exploitation, or stalking is encouraged to seek resources on campus or in the community. Please contact the Director of Title IX Compliance (Adrienne Allison – [Adrienne.allison@unc.edu](mailto:Adrienne.allison@unc.edu)), Report and Response Coordinators in the Equal Opportunity and Compliance Office ([reportandresponse@unc.edu](mailto:reportandresponse@unc.edu)), Counseling and Psychological Services (confidential), or the Gender Violence Services Coordinators ([gvs@unc.edu](mailto:gvs@unc.edu); confidential) to discuss your specific needs. Additional resources are available at [safe.unc.edu](http://safe.unc.edu).

### **Accessibility Resources and Service (ARS)**

The University of North Carolina at Chapel Hill facilitates the implementation of reasonable accommodations, including resources and services, for students with disabilities, chronic medical conditions, a temporary disability or pregnancy complications resulting in barriers to fully accessing University courses, programs and activities. Accommodations are determined through the Office of Accessibility Resources and Service (ARS) for individuals with documented qualifying disabilities in accordance with applicable state and federal laws. See the ARS Website for contact information: <https://ars.unc.edu> or email [ars@unc.edu](mailto:ars@unc.edu).

### **Honor Code**

UNC has a student-led [honor system](#). Academic integrity is at the heart of Carolina and we all are responsible for upholding the ideals of honor and integrity. The student-led Honor System is responsible for adjudicating any suspected violations of the Honor Code and all suspected instances of academic dishonesty will be reported to the Honor System. Information, including your responsibilities as a student is outlined in the Instrument of Student Judicial Governance. Your full participation and observance of the Honor Code is expected. Plagiarism in the form of "deliberate" or "reckless" representation of another's words, thoughts, or ideas as one's own without appropriate attribution to the original author in connection with submission of academic work, whether graded or otherwise, is a serious breach of the academic integrity demanded by the Honor Code and one of the most common forms of academic misconduct processed by the Honor System. Plagiarism can take many forms and there may be a number of reasons why it occurs. Quote and cite any words that are not your own. If you paraphrase the words of another, you must still give proper attribution. All academic work in this course is to be your own work, unless otherwise specifically provided such as the group exercises. It is your responsibility if you have any doubt to confirm whether or not collaboration is permitted.