

# **GEOG 5550 Section 001 - Advanced Geographic Information System (Spring 2023)**

Class Location and Time: ENV 336, Wed 6:00 pm - 8:50 pm

Meeting Dates: 1/17/2023 - 5/12/2023

## **Instructor Information**

Dr. Wei Kang (She/Her)

Assistant Professor

Department of Geography and the Environment

University of North Texas (UNT)

E-mail: [wei.kang@unt.edu](mailto:wei.kang@unt.edu)

Web: <https://geography.unt.edu/people/wei-kang>

Office: ENV 320J

Office Hours: Mon & Wed 2:00 – 3:00 pm, or by appointment.

Teaching Assistant: Douglas Smith, E-mail: [douglas.smith2@unt.edu](mailto:douglas.smith2@unt.edu)

Office: ENV 372

Office Hours: Wed 4:00 – 6:00 pm, or by appointment.

## **Course Description**

This course aims to improve students' spatial thinking skills through advanced GIS topics in spatial data processing, analytics, and modeling, including spatial interpolation, surface analysis, network analysis, open-source GIS, pattern detection and clustering, and local spatial modeling. The course includes a combination of lectures, hands-on lab exercises, homework, quizzes, exams, and a group project.

## **Course Objectives**

Upon successful completion of this course, students will be able to:

- Describe important theories and concepts in spatial analytics and modeling in GIS
- Use spatial analytics and modeling tools
- Apply spatial analytics to solve real-world problems
- Identify new developments in GIS
- Design and implement a GIS project

## **Prerequisites**

GEOG 3500/5510, or consent of department.

## **Software**

Esri's ArcGIS Pro with the Geostatistical Analyst, Spatial Analyst, and Network Analyst extensions. Make sure you have installed ArcGIS Pro 3.0.3 or later.

## **Teaching & learning methods**

This course consists of lecture and lab components. The lecture component will primarily focus on theoretical aspects of spatial analysis and will include discussion of example applications. The lab component will give

students hands-on experience in GIS-based spatial analysis. Reading assignments will also be given to further students' understanding of materials presented in the lectures and labs. A final project will provide students with an opportunity to apply theories and methods learned in the course to topics of their own interest.

## Grading

Evaluation for this course will be based on regular lab assignments, quizzes, and the successful completion of a semester-long course project. Grading will be assigned on the following scale: A: 90-100, B: 80-89, C: 70-79, D: 60-69, E below 60. There will be no curves. A minimum grade of "B" is required for the GIS Certificate. Points are assigned as follows:

| Component            | Points         |
|----------------------|----------------|
| Labs                 | 32 (4pt*8)     |
| Exams                | 25 (10pt+15pt) |
| Project presentation | 18             |
| Project Report       | 25             |
| Total possible       | 100            |

## Lab assignments

Lab assignments will give students practical experience with the topics we cover in class. They will consist largely of problem-solving exercises that employ the GIS methods learned by the students. There will be 8 lab assignments during the semester, each of the lab carries 4 points. Lab assignments will be due on the Wednesday one week after the week that they are assigned.

## Exams

There will be two exams at the middle (10 points) and the end (15 points) of the semester (scheduled on March 8 and April 14); exam dates will be finalized at least two weeks in advance. The exams may include, but not limited to, multiple choice questions, short essay questions, interpretation tasks, calculation tasks, and problem-solving questions.

Exam contents will emphasize theories, concepts, methods, and applications covered in lectures, labs, and assigned readings. The exams will not contain computer components, that is, there are no questions regarding "how to use ArcGIS."

No "make-up" exams will be given; notify the instructor at least two weeks in advance of a scheduled exam date if an alternative date is necessary.

## Semester Project

The semester project is the centerpiece of your work for the course. In consultation with the professor, you will form a group of 1-2 students, choose a topic of interest to your group to investigate with GIS. The project is worth a total of 50 points and includes the following components:

- A one-paragraph description of your proposed research project, due on Mar 1. This paragraph should simply consist of your ideas for a project you are interested in completing; we'll use this brief proposal to help refine your topic over the next month.
- A presentation of the results of your research project worth 18 points; you'll give the presentation on May 3.

- A final report that presents the results of your research project. The report should include an introduction, literature review, methodology section, results section, and conclusion. The report is due May 8 (the Monday of finals week) and is worth 25 points.

**I do not round, curve, or negotiate grades with students.** However, I will make an exception to this rule and round your grade (0.5 and up to the next whole number) if you have **no missed attendance** and **no late assignment submissions**.

### Lateness/make-up policy

Labs *are due* at **6:00 pm** for lab assignments and **10:00 pm** for other assignments on the day indicated in the course schedule. Late submissions **will not** be accepted.

### Attendance

Research has shown that students who attend classes are more likely to be successful. You should attend every class unless you have a university-excused absence such as a documented illness or emergency, an active military service, a religious holy day, or an official university function as stated in the [Student Attendance and Authorized Absences Policy](#). Students who have missed three classes will not pass.

### Required/Recommended Readings

| Abbreviation | Source   |
|--------------|--|
| <b>GSA</b>   | Michael J. de Smith, Michael F. Goodchild, and Paul A. Longley, Geospatial Analysis, 6th Edition, 2021 update. ( <a href="#">Free web version</a> )  |
| <b>GIST</b>  | The Geographic Information Science & Technology (GIS&T) Body of Knowledge. John P. Wilson (ed). University Consortium for Geographic Information Science (UCGIS). ( <a href="#">Free Online Resource</a> ) |
| <b>DOC</b>   | Documentation of ArcGIS Pro extensions. ( <a href="#">Free online resource</a> )   |

### Course Schedule

Please note that the schedule below is indicative only and may be subject to change.

| Week | Date  | Topic  | Readings   | Assignments                                    | Due   |
|------|-------|--|--|--|-------|
| 1    | 01/18 | Introduction, Syllabus, Course Project, Installation |  | Esri Tutorial: Getting started with ArcGIS Pro |       |
| 2    | 01/25 | Spatial Interpolation I                              | GSA 6.5 Gridding, Interpolation and Contouring & 6.6 Deterministic Interpolation Methods | Lab  | 02/08 |
| 3    | 02/01 | Campus closed – No Class                             |  |  |       |
| 4    | 02/08 | Spatial Interpolation II                             | GSA 6.7 Geostatistical Interpolation Methods   | Lab  | 02/15 |
| 5    | 02/15 | Hydrologic Modeling                                  | GSA 6.4 Watersheds and Drainage  | Lab  | 02/22 |
| 6    | 02/22 | Surface and 3D analysis                              | GSA 6.1 Modeling Surfaces, <a href="#">GIST AM-17</a>                                    | Lab  | 02/29 |

|    |       |   |                                     |  |       |
|----|-------|---|-------------------------------------|--|-------|
| 7  | 03/01 | Cartographic Modeling & Map Algebra I                       | <a href="#">GIST AM-12</a>          | Lab, Proposal due                              | 03/11 |
| 8  | 03/08 | Exam I  |                                     | Exam I   |       |
| 9  | 03/15 | Spring Break – No Class                                     |                                     |  |       |
| 10 | 03/22 | Exam I review & Cartographic Modeling & Map Algebra II      | <a href="#">GIST AM-06</a>          |  |       |
| 11 | 03/29 | Make up exam & Cartographic Modeling & Map Algebra II & Lab |                                     | Lab for Cartographic Modeling & Map Algebra II | 04/05 |
| 12 | 04/05 | Network Analysis I  | GSA 7 Network and Location Analysis | Lab  | 04/12 |
| 13 | 04/12 | Network Analysis II   |                                     | Lab  | 04/19 |
| 14 | 04/19 | Project Work  |                                     |  |       |
| 15 | 04/26 | Exam II & Project Work                                      |                                     |  |       |
| 16 | 05/03 | Project presentation  |                                     |  |       |
| 17 | 05/08 | (Final Week) Project Report Due                             |                                     |  |       |

## How to Succeed in this Course

I value the many perspectives students bring to our campus. Please work with me to create a classroom culture of open communication, mutual respect, and inclusion. All discussions should be respectful and civil. Although disagreements and debates are encouraged, personal attacks are unacceptable. Together, we can ensure a safe and welcoming classroom for all. If you ever feel like this is not the case, please stop by my office and let me know. We are all learning together.

Every student in my class can improve by doing their own work and trying their hardest with access to appropriate resources. Students who use other people's work without citations will be violating UNT's Academic Integrity Policy. Please read and follow this important set of [guidelines](#) for your academic success. If you have questions about this, or any UNT policy, please email me or come discuss this with me during my office hours.

## Office Hours

Office hours offer you an opportunity to ask for clarification or find support with understanding class materials. Come visit me at ENV 320J or via a Zoom meeting during the office hours Mon & Wed 2:00 – 3:00 pm! (Please also do not hesitate to talk to our TA should you have any questions about course materials). I also encourage you to connect with me through emails for support. During busy times, my inbox becomes rather full, so if you contact me and do not receive a response within two business days, please send a follow-up email. A gentle nudge is always appreciated. Your success is our goal.

We will use Canvas to distribute course materials and gather assignments. If you are not familiar with Canvas, or if you have any questions about using Canvas, please read the [Canvas Student Guide](#).

## UNT Policies

### Academic Integrity

According to [UNT Policy 06.003](#), Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

Specifically, all submitted work should be your own and academic dishonesty is not allowed. Academic dishonesty can be defined as:

- Copying answers.
- Copying words, ideas, or other materials from another source without giving credit to the original author.
- Copying from your peers within the course.
- Employing or allowing another person to alter or revise your work, and then submitting the work as your own.

Please don't share or reuse solutions to assignments which is an academic integrity concern. Please do not:

- Share complete assignment.
- Upload completed assignments to public websites with the goal of sharing solutions. (You can share your work and ideas for professional purposes though).
- Take a peer's solution and submit it as your own.

### ADA Accommodation Statement

UNT makes reasonable academic accommodations for students with disabilities. Students seeking reasonable accommodation must first register with the [Office of Disability Access \(ODA\)](#) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to the faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time; however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the [ODA website](#).

### Acceptable Student Behavior

Students and student groups are expected to conduct themselves in a manner that demonstrates respect for the rights and property of others and upholds the integrity and values of the University community. Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classrooms, labs, discussion groups, field trips, etc. Visit [UNT's Code of Student Conduct](#) to learn more.

## **Emergency Notification & Procedures**

UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.