

# SYLLABUS :: GEOG 670 – Geographic Information Systems and Science

## Instructor

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## Teaching Assistant

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Fridays 10 – 11 am

## 1. Description

Geographic Information Systems (GIS) is an application-led technology that handle the analysis and management of geographic information, and Geographic Information Science (GIScience) underpins theories and concepts in GIS for geospatial problem solving that are essential for effective and proper use of GIS.

This course offers fundamental understanding of geographic concepts and principles of GIScience, along with hands-on experience solving geographical problems, using GIS software and real world data (including census demographic information, land cover / land use maps, digital elevation models, and imagery datasets).

By the end of the course, you should understand the essential functionality of GIS, methods for implementing the technology, and its potential usefulness for geographical investigations. The knowledge you gain will be applicable to any GIS, while we use ESRI's software suite as an example in the lab.

## 2. Learning Objectives

Students are expected to (1) understand the basic structures, concepts, and theories of GIS, and (2) be able to effectively use common GIS operations to examine a geographic problem of interests (including data collection, processing, analyses, and cartographic presentation).

## 3. Prerequisites

There are no formal pre-requisites for this course. However, students with no prior experience in geography are advised to devote extra time to assigned reading, as much of the underlying principles of GIS come from the discipline of geography.

Students are expected to back up their own coursework. If using USB drives, make sure to reserve enough space (e.g. 20 gigabytes).

## 4. Course Structure

The course will be broken into instructor-led lectures, demos, and lab working sessions. In-class and out-of-class computer exercises will be completed on a weekly basis. Three exams will be given throughout the semester. Students are advised to keep a [Lab Notebook](#) to record the GIS techniques completed,

problems and solutions associated with each technique, thoughts and comments, and other helpful hints discussed in class, creating a reference of GIS terminology, commands, and tools.

## 5. Text Book, Readings, and Online Resources

Longley, Paul A., Michael F. Goodchild, David J. Maguire, and David W. Rhind. 2015. *Geographic Information Science and Systems*, Fourth Edition. John Wiley & Sons. ISBN 978-1-118-67695-0

Students are expected to read the chapter(s) in the text book associated with each lecture as shown in the course schedule below, while focusing on topics and their interconnections highlighted by the lecture.

Additional readings when applicable will be made available on Canvas as the semester progresses. Valuable resources online will also be emphasized such as ESRI's websites, open source forums, or relevant blog postings.

## 6. Grading

COMPONENTS	PERCENTAGE
Exercises	40 %
Exam 1	18 %
Exam 2	18 %
Exam 3	18 %
Attendance & Participation	6 %

Grades of exercises and exams are based on (1) academic merits of your answers and (2) conciseness of the presentation of answers.

Assignments must be turned in on or before the due date posted in Canvas to receive credit. Each student is allowed late submission for up to two assignments, given s/he (1) notifies the TA before the due date and (2) makes the submission no later than 1 week past the due date posted in Canvas. Unannounced late submission will not be accepted. Additional grace periods might be granted in case of severe medical conditions, but it is the student's responsibility to provide a written report from a medical doctor stating the student's inability to carry out coursework as expected.

Course contents are organized as three blocks: Principles of GIS, Techniques of GIS, and Analysis in GIS. The three exams each cover one block of contents. Exams 1 and 2 are hour-long closed-book tests. Exam 3 is an open-book take-home practical exercise, where students will choose one out of a few spatial analysis problems presented, solve the problem using skills learned throughout the semester over a three-week exam period, and write a 2-page final report. More detailed instructions will be given at the time of the exam.

A short quiz will be given for each lecture starting with the second lecture of the semester. Quizzes will be released on Mondays and should be completed before class on Tuesdays. Quizzes for the first two blocks of the course (i.e. principles and techniques of GIS) are open-book, allow unlimited number of tries, and count toward students' participation scores (i.e. not graded). These quizzes are meant as a feedback mechanism for students to evaluate their level of understanding of course materials. In

contrast, quizzes for the third block of the course (i.e. analysis in GIS) allow only two tries for each quiz with the higher score recorded, although also are open-book. The scores of these quizzes each count as 10% toward Exam 3 scores.

Make-up exams can be arranged in case of excusable absence as defined in UD Catalog under “Attendance Policies”. It is the student’s responsibility to inform the instructor before the absence, provide written documentation of reason for the absence, and take the exam no later than 1 week after the period of absence.

## 7. Other Important Issues

### *Academic Honesty*

Each student is expected to be honest and forthright in their academic endeavors. Please review the Reference Guide to Academic Integrity (<https://sites.udel.edu/studentconduct/academic-integrity/>) to understand the strict and high standards of the University of Delaware and ways to protect yourself.

### *Inclusion Statement*

Our classroom is a place of mutual respect and is inclusive of all students. This environment must be free of any discrimination, where everyone is comfortable and at liberty to contribute to and benefit from the learning experience. We ask you to help facilitate this environment and enhance positive interactions in the class. If you have any concerns and/or suggestions, please bring forward to the Instructor. Additionally, students in need of special accommodations should contact the Office of Disability Support Services at [dsoffice@udel.edu](mailto:dsoffice@udel.edu), and students who encounter inaccessible web technology at UD should contact [accessibility@udel.edu](mailto:accessibility@udel.edu) for assistance.

### *Classroom Etiquette*

Students are asked to silence their phones and disconnect from distracting digital feeds. The class time and computational resources are designated only for course related activities. If you must answer a phone call or respond to a message, please step outside of the classroom.

### *Sexual Misconduct Policy*

The University of Delaware prohibits sexual discrimination, sexual assault, sexual harassment, dating violence, domestic violence and stalking by anyone on University property. This policy is intended to keep the University community free from sexual misconduct and is designed to ensure a safe and non-discriminatory environment that protects the constitutional and civil rights of students, faculty and staff, as well as vendors, guests, visitors and volunteers, regardless of their sexual orientation or gender identity. For resources and support visit <https://sites.udel.edu/sexualmisconduct/>.

## 8. Course Schedule

	WEEK	TOPIC	CHAPTER	EXERCISE
1	2/12	Intro to Course & Intro to GIS	1	Intro to ArcGIS Pro
2	2/19	Nature of Geographic Data	2	Data in ArcGIS Pro
3	2/26	Representing Geography	3	Data Types
4	3/5	Hour 1: Georeferencing Hour 2: Georeferencing (cont), Uncertainty	4 5	Coordinate Systems & Map Projections
5	<u>3/12</u>	review 1, self-study, Q&A		Address Matching
6	<u>3/19</u>	<b>EXAM 1: Principles of GIS</b>		Image Rectification & On-Screen Digitizing
7	3/26	GIS Software, Geographic Data Models	6, 7	Topology
8	4/2	<b>Class Suspended – Spring Break</b>		
9	4/9	GIS Data Collection	8	Individual GPS Exercise
10	<u>4/16</u>	Geographic Databases	9	Preprocessing
11	4/23	<b>EXAM 2: Techniques of GIS</b> Cartography	11	Cartography
12	4/30	Spatial Analysis I (intro, vector-based analysis) <b>EXAM 3 HANDOUT: Analysis in GIS</b>	13	Vector Analysis
13	5/7	Spatial Analysis II (raster-based analysis, hypothesis testing)	14	Raster Analysis
14	5/14	Spatial Modeling	15	Model Builder & Python Scripting
15	5/21 (finals week)	<b>EXAM 3 DUE: Analysis in GIS</b>		