UMassAmherst SYLLABUS

Introduction to GIS

NRC585 – 4cr.

Course Info

Instructor: Michael Nelson michaelnelso@umass.edu
Course website: https://michaelfrancenelson.github.io/intro_gis/
Lecture meeting times: Tuesday and Thursday 9:45AM – 11:00AM
Lab meeting times: to be determined the first week of class

Course Objectives and Description

This class serves as an introduction to Geographic Information Science (GIS). GIS is the science of spatial relationships, linking data to locations to explore relations between objects. Based in geographic thought and emerging from initial applications in natural resource management, GIS has evolved to be a universally applicable way of thinking and set of tools. Through lab work and foundational lecture, this course covers the guiding principles behind various facets of GIS including the nature of spatial data, map projections, spatial analysis, and cartographic production. By evaluating the relationship between different spatial information, you can identify the best location for new development, locate pollution point sources, find the easiest way to get from point A to point B, and develop a better understanding of the way the world interacts. The goals of this course are to teach you basic GIS concepts through practice and theory to enable you to make useful and meaningful contributions to various disciplines through spatial analysis. Throughout this course, you will be challenged to not only think spatially, but apply spatial analysis techniques within GIS.

Class Websites

There are extensive web-based materials associated with this class, housed on the course Moodle and GitHub sites. Course materials (assignments, walkthroughs, data, etc.) will be housed and updated on the public GitHub site. Non-public course materials (such as the midterm) will be made available on the course Moodle site. You will submit your work through Moodle.

Course Software

This course will use the **ArcGIS PRO** suite of software developed by ESRI.
Arc is a Windows program and does not function on other operating systems, like Mac OS or Linux. Don't panic if you don't have a Windows computer, you'll still be able to Arc through a virtual desktop! Lab 1 covers software access and installation.

NOTE: Arc is commercial software, however all UMass students taking GIS courses can obtain a free license.

We will also use Microsoft OneDrive and Windows Virtual Desktop in this course. See the software setup details in Lab 1 on the course website for details of how to download and obtain a license for Arc, request access to Windows Virtual Desktop, and set up OneDrive.

Required Materials

There is no required textbook.

Additional Readings and Data Sources

- The National Center for Geographic Information & Analysis (NCGIA) Core Curriculum in GIScience, a guide to key GIS topics: https://escholarship.org/uc/spatial_ucsb_ncgia
- The ESRI Academy, a guide to all things ArcGIS: https://www.esri.com/training/
- The Geographers Craft web site developed by Peter Dana and Ken Foote: https://foote.geography.uconn.edu/gcraft/contents.html
- An excellent introductory GPS website is provided by Trimble Navigation: http://www.trimble.com/gps/
- Texas A&M's award-winning Maps and GIS library has some good tutorials on common GIS tasks: https://tamu.libguides.com/gis/tutorials\

Class Attendance

This course is in a hybrid synchronous/asynchronous format. That means you may attend the real-time lectures or watch the videos after they are posted to Echo360. If you plan to take the class asynchronously, I highly recommend you watch the lectures as soon as convenient after they are posted because the lecture content is coordinated with the labs. With the compressed summer schedule, getting caught up if you fall behind will be more difficult than in a Fall or Spring session.

Attendance at the live lab sessions is also not required but is highly recommended. I'll do my best to schedule lab times that are accessible to all students, considering everybody's working and life schedules.

Email and Zoom

Students should use their **university-associated email accounts** when emailing the instructor and teaching assistants. You will receive email announcements detailing course scheduling and important events. It is your responsibility to check your email account regularly.

Our course Zoom channel does not require a password, however, to join the Zoom meetings you will have to log into Zoom using your UMass university-associated email account.

Grading

Your grade in this class will be based on performance from lab exercises, a practical exam, your final projects, and course participation.

Dates and times of examinations are listed on the class schedule at the end of the syllabus.

A	**Lab Reports (7 total – your lowest lab score is dropped)**	**45%**
B	**Midterm**	**20%**
C	**Final Project**	
	1. Project Sign-up and General Description	**5%**
	2. Project Outline and Analytical Proposal	**10%**
	3. Final Poster and Data Sharing	**20%**

Grading Schema:

A: 93 – 100%	B+: 87 – 89.9%	C+: 77 – 79.9%	D+: 67 – 69.9%
A-: 90 – 92.9%	B: 83 – 89.9%	C: 73 – 76.9%	D: 60 – 66.9%
	B-: 83 – 86.9%	C-: 70 – 72.9%	F: below 60%

Late policy: Lab assignments are accepted without penalty after the due dates, however late submissions may result in delays in grading and providing feedback to you. The lab assignment dates are designed to maintain an even workload through the semester, both for you and our graders. The midterm timing, however, is not flexible without prior communication. Late final project components will incur a 25% reduction in credit, unless prior arrangements have been made.

Labs

Labs are an important and integral portion of the course. There is simply no way to learn about GIS without spending considerable time in lab working on GIS problems. It is in your best interest to attend the entire lab session and complete as much of the lab as possible during your scheduled lab section. However, **in general the labs will take longer than the synchronous lab session**. Your instructor and TA are available to help both during lab sessions and are available to help outside of lab during office hours. If you are struggling with a lab topic, be sure to **reach out with questions early**. Remember that we're here to help.

Expect to work on labs and your project outside of scheduled class time!

In past years, failure to complete labs in a timely manner has been the primary cause for poor performance in this class. It is your responsibility to keep up with lab assignments. You should talk to the instructor before late labs become a problem.

Lab Reports

Labs data and tutorials will be available on the course website.

Each lab assignment is different. Almost all labs require a map in addition to answers to questions and/or description of methods. Please refer to the individual lab assignments for instructions.

Upload labs to Moodle as PDF files. DO NOT UPLOAD PROJECT FILES FROM ARC. Arc project files cannot be opened without the associated spatial data – these files cannot be graded.

You are encouraged to work with others on the lab assignments; however, the product you hand in **must be your own work**. **Duplicated assignments will receive a 0.**

Course Schedule (subject to adjustment as needed)

Week	Lecture	Date	Lecture Topics	Lab Assignments
1	1	Tuesday May 30	• Introductions • Course Overview • Spatial Data	• Lab 1: Software Setup + Introduction to Arc • Lab 2: Joins and Selects
	2	Thursday June 1	• Spatial Data Types • Cartography Basics • Intro to Final Projects	
2	3	Tuesday June 4	• Vector Data	• Lab 3: Vector Analysis • Lab 4: Projections • Final Project sign-up
	4	Thursday June 6	• Modeling the Earth's Shape • Ellipsoids, Coordinates, and Datums • Intro to Projections	
3	5	Tuesday June 13	• Midterm Topics Recap	• Begin on Final Proj. Proposal • Midterm
	6	Tuesday June 15	•Spatial Data Creation and Editing	
4	7	Tuesday June 20	• Global Positioning System (GPS) and Applications	• Lab 5: Creating Spatial Data • Lab 6: Spatial Analyst
	8	Thursday June 22	• Raster Data	
5	9	Tuesday June 27	• Remote Sensing	• Lab 7: Geostatistics • Final Projects
	10	Thursday June 29	• GIS Application: Habitat Modeling	
6	-	Tuesday July 4	No Class!	• Lab 8 • Final Projects
	11	Thursday July 6	• Spatial Analysis • Point Patterns • Geostatistics	

7	12	Tuesday July 11	• Model Thinking and Problem Solving	• Final Projects

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Midterm

The midterm exam will test your knowledge of general GIS concepts, how well you can solve problems in GIS based on skills learned in the first five labs, material covered in lecture, and your general problem-solving capabilities. The midterm is in the form of a Moodle Assignment. It will be open to everyone for 1 week in Moodle. It is crucial that you have completed labs 1 – 5 before this time; you will not do well on the midterm if you have not mastered the material in these labs. If you have concerns regarding your readiness for the midterm, it is vital that you be in touch with me before the start date of the exam.

Final Project

The final project is an independent research project visualizing and analyzing spatial data. With the support of ideas from faculty and community members across New England, you will be tasked with a GIS problem to solve or project to create, as well as finding GIS data needed to answer that question, and conducting a GIS analysis of those data. To formulate a research question, think back to other classes you've taken for inspiration, browse for ideas online, and talk to faculty and students for ideas. You may work with a partner on the final project as long as there is a clear division of labor based on consultation with me.

Completing the project will require substantial time outside of scheduled labs, so plan ahead!

A complete description and rubrics for the final project are available on the GitHub site.

<u>The final project will be graded in three parts:</u>

1. Project signup and general description

You'll provide a brief description of your proposed project. You may select from a range of potential project ideas we provide, or you may choose a custom project, perhaps based on your research interests. You should consult with your instructor and TAs as needed to help you choose a project.

2. Methodological outline and study area map

An outline of your project topic and the methods you plan to use to tackle your GIS research question. The outline must include:

- A description of your planned research project.

- A table of the datasets that you will use to complete your project, a short description of the data, and the data source(s).
- An outline of the mapping and/or analytical steps required to complete your research project.
- A map of your study area using appropriate cartographic techniques – invest the time making a professional map that you can reuse on your final poster.

3. Final poster

You'll present your final project work on a research poster. The poster should loosely follow the format of a scientific paper with the traditional 4 sections: introduction, methods, results, and discussion.

4. Optional virtual poster presentation

At the end of the class, we'll hold an optional virtual poster presentation session. Participation is not required; however you'll receive 2% extra credit applied to you overall course grade if you present your poster.

Assignment Timeline

Lab Due Dates

Labs are due by 11:55PM on the following dates:

- Lab 1: Monday June 5th
- Lab 2: Monday June 5th
- Lab 3: Monday June 12th
- Lab 4: Monday June 12th
- Lab 5: Monday June 19th
- Lab 6: Monday June 26th
- Lab 7: Monday July 3rd
- Lab 8: Monday July 10th

Midterm

The midterm will open on Friday June 16 12:01AM, and close Thursday June 23 at 11:55PM

Final Project

- Signup and general description: June 12th
- Methods outline & study area map: June 19th
- Final poster: Monday July 10th

Late Work Policy

It's essential to keep up with the lab work, especially in the compressed summer schedule. Failure to complete assignments on time often results in poor performance in the course. Assignments will be accepted after the due dates, but a 10% late penalty will be applied to all late assignments, unless other arrangements have been made.

Life happens, so if something comes up, or you are struggling to complete an assignment on time make sure you reach out ASAP.

Academic Honesty

Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. For further details, see http://www.umass.edu/honesty/

Student Support

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities.

Disability Services • 161 Whitmore • 413-545-0892 • www.umass.edu/disability

The University of Massachusetts Amherst is committed to making reasonable, effective and appropriate accommodations to meet the needs of students with disabilities and help create a barrier-free campus. If you are in need of accommodation for a documented disability, register with Disability Services to have an accommodation letter sent to your faculty. It is your responsibility to initiate these services and to communicate with faculty ahead of time to manage accommodations in a timely manner. For more information, consult the Disability Services website at http://www.umass.edu/disability/.

There are numerous other student support organizations on campus including:

Learning Resource Center • Library 10th floor • 413-545-5334 • www.umass.edu/lrc
Offering peer-tutors trained to assist you in meeting academic challenges and achieving academic success.

Writing Center • Library Lower Level • 413-577-1293 • www.umass.edu/writingcenter
Knowledgeable tutors are available to work with you on your writing. Tutors offer 45-minute consultations where they ask questions about the assignment, offer tips and advice.

Resource Librarians • Library Main Level • 413-545-0150 • www.library.umass.edu/liaison
Subject-specialist librarians are available to help find the right sources, databases and strategies for your research needs.

University Ombuds Office • 823 Campus Center • 413-545-0867 • www.umass.edu/ombuds
Resources and confidential advice related to the university's academic honesty policy and procedures.

Center for Counseling and Psychological Health • 127 Hills North • 413-545-2337 • https://www.umass.edu/counseling/
Provide short term individual, couple's and group psychotherapy; psychiatric medication consultation and treatment; psychological assessment (testing); behavioral medicine; and crisis intervention services.

Please do not hesitate to ask me if you have any problems or if you are having any trouble in the class, see me **before it becomes a *problem.***
