**Advanced Geographic Information Systems -** Course Syllabus

Instructor:

Professor Daniel A. Barone, [daniel.barone@rutgers.edu](mailto:baroned.nj@gmail.com)

PREREQUISITES

Intro to GIS (01:450:321)

COURSE OBJECTIVES

            The course is designed to advance students’ GIS skill and enrich their experience in GIS applications. It provides a solid ground for students to start their GIS career. When students finish this class, they are expected to understand GIS approach in decision-making process, be familiar with advanced GIS techniques, GIS analysis and manipulation, problem-solving using GIS, and customization of GIS projects.

COURSE CONTENT

            Course content includes the concepts of problem-solving principles and strategies. This course introduces students to the most advanced GIS operations such as geoprocessing, modeling, terrain analysis, distance analysis, network analysis, 3-D modeling, and web-GIS using ArcGIS Pro.  It focuses on problem solving skills by requiring students to complete a series of ESRI web courses about these advanced techniques with easy-to-understand step-by-step instructions and by guiding students through problem solving assignments. Each student is also required to complete a student-initiated GIS project. This project will help students understand and experience the entire process of GIS application, which includes understanding the problem, data collection, database development, data analysis and manipulation, project documentation, and poster presentation.

COURSE STRUCTURE

            In the first half of the semester, students are assigned with 9 short web courses provided by ESRI’s virtual campus training site, where students will access both lectures and hands-on exercises. After completing each web course, students are required to do a similar small project using the same skill/technique learned from the web course as a reinforcement.

ATTENDANCE

            Attendance is encouraged for troubleshooting and applied concept lectures.  If you are unable to attend class, please let the instructor know ahead of time to arrange missed assignments.

Completion of all assigned ESRI web courses is required. These courses are listed in the email file you received prior to the course start. Students SHOULD FINISH ALL ESRI WEB COURSES BEFORE SPRING BREAK. Please follow the sequence of exercises within each course without skipping. EVERY TIME after a student finishes a web course, they must complete a small project using the same technique learned from the web course and with their own datasets (i.e. downloaded from an online source or other location within the GIS lab). The small project Word documents must explain the datasets used, how he/she has solved the problem, and what the result shows.  A screen capture of your final map should be included in the word document.

All web course tests are also to be completed with a score of 80 or above. A student may retake a test as many times as he/she wants. Zero will be the score for any unfinished test or test scored less than 80. All test scores will be automatically recorded into students’ ESRI Education accounts, which need to be printed as a PDF and submitted to Canvas after all assigned web courses are completed.

In addition to finishing the web courses, each student is required to complete a student-initiated GIS project and produce a poster presentation of the GIS project. The poster guideline is at the bottom of the syllabus. Each student should make an appointment with the instructor to discuss their idea of the project as early as possible. **The project proposal (see the guideline below) is typically due first week of March (upload to Canvas prior to class)**. There will be 25% late penalty for the proposal. Students should not start their project before their proposal is approved by the instructor. The project poster must be submitted by the end of REGULAR CLASSES. Final project presentations will be given at the scheduled exam meeting the following week (DATE TBD).

TEXT BOOK

None

EVALUATION

            To be successful in this class, a student needs self-motivation and self-discipline to complete all coursework on time without skipping any course content. You will be evaluated based on the following components:

Activities                                                                                                                 % of Course Grade

The % completion of web course and the small projects using our own data                    25%

The average grade points of all web course tests (finished or unfinished)                       25%

Student initiated GIS project proposal                                                                                    10%

Student initiated GIS project and poster presentation                                                          40%

PROJECT PROPOSAL GUIDELINE (1 – 2 pages)

**Project Description**

Brief descriptions of the project including:

* 1. Brief introduction and background information of the project
  2. What is the significance of the project or why you think it is important to do this project?
  3. What is the objective of the project? Or what are the specific tasks?

**Criteria (i.e. How do you apply the principle of the discipline to this study specifically?)**

What are the criteria and how specifically you are going to apply the criteria to this project? Why?

**Data and data sources**

1. Where is your study area?
2. What data are needed for the project?
3. Where do you get the data needed?
4. How long does it take for you to get all data needed for the project?

**Methods**

What GIS tools are you going to use?

Step by step processes planned? Explain what and why in each step.

**Results**

What kind of results (maps) do you expect? Does your expected result address the question ( or objective) above?

**Timeline**

How long does it take to finish the project? What is your time table?

PROJECT POSTER GUIDELINE

1. Make a layout in ArcGIS Pro containing your project-related maps and graphs. The minimum size of the layout (poster) is 36 (height) x 42 (width) and the maximum height of the plotter paper is 42 in.
2. Your poster should contain the following components:
3. Title of your project
4. Author’s name and course title
5. Affiliation, “Rutgers Program, Course Name/Number, Rutgers University”
6. Abstract, **briefly** describe the objective of the project, general methodology, major results, and conclusion. The abstract should be clear and well written
7. Introduction, **briefly** describe the background and the significance of the. Introduction should be easy to understand and well written
8. Objective, brief and clear. One or two sentences
9. Methodology, describe the methods that you used in the project using easy to understand language. **Do not** use ArcGIS technical terms. Methods include:
   * Data and data sources
   * Data manipulation and analysis
10. Results, **brief, clear, logical, and graphical**
    * Present your results with maps and graphs and/or tables
    * Each map/graph/table should have a title, self-explanatory legend, and a brief caption about the meaning of the graph (what you want the reader to see).
11. Conclusion and discussion, brief and well written
    * What is the significance of the project results?

The poster should be well organized, colorful, clear, and self-explanatory.

Check your poster on screen using Print Preview to make sure the size fits. ArcMap does not have auto-spelling-check function. Make sure to **check spelling yourself**. Let me know when you need help to set up the page. Use the plotter to print when you are ready.

**HONOR PLEGE:**

All students will need to sign the Rutgers Honor Pledge on every major exam, assignment, or other assessment as follows:

“On my honor, I have neither received nor given any unauthorized assistance on this examination (assignment, paper, quiz, etc.).”

**TECHNOLOGY REQUIREMENT RESOURCES**

Please visit the Rutgers Student Tech Guide page for resources available to all students.  If you do not have the appropriate technology for financial reasons, please email Dean of Students [deanofstudents@echo.rutgers.edu](mailto:deanofstudents@echo.rutgers.edu) for assistance.  If you are facing other financial hardships, please visit the Office of Financial Aid at [https://financialaid.rutgers.edu/Links to an external site.](https://financialaid.rutgers.edu/).

**LEARNING GOALS**

This course satisfies the following SAS Core Curriculum learning goals:

QR: Apply effective and efficient mathematical or other formal processes to reason and to solve problems.

ITR: Employ current technologies to access and evaluate information, to conduct research, and to communicate findings.

This course satisfies the following Geography program learning goals part of the Geographical Techniques track:

* To demonstrate an understanding of fundamental principles, concepts and knowledge of geographic technologies used in the acquisition, processing and analysis of spatial geographic data.
* To be able to locate, access, manipulate, display and communicate spatial geographic data on selected topics.
* To become fluent in specific applications that support career prospects.

This course satisfies the following learning goals for the Environmental Studies Program:

Environmental Methods/Techniques/Strategies of Interpretation – Students who complete the course will be able to demonstrate proficiency in at least one method, technique, or strategy of interpretation for environmental inquiry in the natural sciences, social sciences and/or humanities.

**STUDENT SUCCES:**

The faculty and staff at Rutgers are committed to your success. Students who are successful tend to seek out resources that enable them to excel academically, maintain their health and wellness, prepare for future careers, navigate college life and finances, and connect with the RU community. Resources that can help you succeed and connect with the Rutgers community can be found [here](http://success.rutgers.edu/), and nearly all services and resources that are typically provided in-person are now available remotely.

**ACADEMIC INTEGRITY RESOURCES:**

[https://nbprovost.rutgers.edu/academic-integrity-studentsLinks to an external site.](https://nbprovost.rutgers.edu/academic-integrity-students)