Credits: 4  Hours: 6 (2 lecture, 4 lab)
Class Meeting Time: Wednesdays, 5:00 - 10:00 pm
Class Location: Gillet Hall, Rm. 322 (GISc Lab)
Instructor: Dr. Juliana Maantay, Dept. of Environmental, Geographic, and Geological Sciences
Office: Gillet Hall, Rm. 325  Tel: (718) 960-8574  Fax: (718) 960-8584
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Office Hours: Wednesdays, 2:00 pm – 4:00 pm, and by appointment

Course Description:
“Special Projects in GIS” has been developed to meet the needs of students using Geographic Information Systems to conduct research in any of the natural and social science disciplines, and who wish to apply more advanced GIS techniques to their analyses. This course will enable intermediate GIS users to expand their knowledge of current methodologies, and to prepare them to conduct more complex and meaningful analyses involving modeling and simulation.

This term, the course will explore in depth the topic of Spatial Analysis and Environmental Modeling with GISc, and will give students the opportunity to design and develop a major GIS project. Through a series of lectures, GIS laboratory work, and the design of a GIS project, students will learn more advanced GIS spatial techniques and their applications to environmental analysis and management, urban planning, risk and hazard assessment, and other arenas of public policy and decision-making.

Course Objectives:
After successfully completing this course, students will be able to:

- Explain and use the basics of geospatial analysis, interpolation, and descriptive statistics;
- Understand the concepts of data aggregation, resolution, unit of analysis, geographic extent, spatial autocorrelation, ecological fallacy, modify able areal unit problem (MAUP), non-uniformity of space;
- Use GISc methods for qualitative and quantitative research;
- Conduct simple environmental modeling and have a familiarity with the different types of models, and appropriateness of various models to particular problems;
- Construct a cartographic model using Boolean logic and map algebra;
- Design a research project design using GISc, including hypothesis generation, selection of methodological approach and analytical techniques, literature review, critical evaluation of previous research studies, report writing, and oral presentation;
- Integrate geospatial analysis and GISc applications in an interdisciplinary manner to solving “real world” problems, incorporating information and research questions from other fields, such as public health, botany, political science, geology, demography, environmental science, sociology, and urban planning.
Assessment:
Your understanding of the course material will be evaluated through lab assignments, an oral presentation, a written and graphic project proposal paper, a final exam, and in-class discussion and participation.

Course Requirements/Grading Information:
- Lab Assignments (40%)
- Project Proposal Paper and In-Class Presentation (25%)
- Class Discussion & Participation (10%)
- Final Exam (25%)

Required Text:
A Course Reader, available at the Lehman Bookstore, consisting of chapters from the following books:
- Vegetation Mapping: From Patch to Planet, by Roy Alexander and Andrew Millington, 2000, John Wiley and Sons, Ltd., Chichester, UK
- Geographic Information Analysis, by David O'Sullivan and David J. Unwin, 2003, John Wiley and Sons, New York, NY
- Applied GIS and Spatial Analysis, John Stillwell and Graham Clarke, eds., 2004, John Wiley and Sons, New York, NY

NOTE: There are also some required readings of selected journal papers which will be available on the GISc Lab server for saving to your flash drive. Readings are to be done in advance of the week in which they are listed. For instance, the readings listed under Class 2 should be read prior to Class 2.

• The complexities of measuring access to parks and physical activity sites in New York City: a quantitative and qualitative approach, 2009. by Andrew R Maroko, Juliana A Maantay, Nancy L Sohler, Kristen L Grady, and Peter S Arno, International Journal of Health Geographics;

**Class Schedule:**

**CLASS 1 (9/1)**

**Discussion Topic:** Introduction to the Course, and Review of Basic Mapping and GIS Principles

**Lab Work:** Assignment #1: “Refresher Lab – Creating Chorochromatic and Proportional Symbol Maps: National Forests of the Western United States.”

(9/8 – NO CLASS – HOLIDAY)

**CLASS 2 (9/15)**

**Discussion Topic:** Statistical Mapping

**Lab Work:** Assignment #2: "Generating Buffers and Using Select by Location for Proximity Analysis: Impact of Fire Burn Areas in Yellowstone National Park.”


*(NOTE: 2d and 2e are on the GISc Lab server, not in course reader)*

**CLASS 3 (9/22)** (in class assignment – river EPT analysis)

**Discussion Topic:** Cartographic Modeling, Map Algebra, and Spatial Analysis

**Lab Work:** Complete Lab Assignment #2.

**Reading Assignment:** 3a. Berry, Topic #8; 3b. Johnston, Chapter 3; 3c. *GIS for the Urban Environment*, Juliana Maantay and John Ziegler, 2006, ESRI Press, Redlands, CA Chapter 9 “Methods of Spatial Data Analysis,” pages 209-245. *(NOTE: 3c is on GISc Lab server, not in course reader)*

**CLASS 4 (9/29)**

**Discussion Topic:** Environmental Spatial Databases and Mapping

**Lab Work:** Assignment #3: "Importing ArcInfo Coverages and Working with a Global Environmental Database: Soil Degradation in South America."

**Reading Assignment:** 4a. Goodchild, Chapter 35; 4b. Clarke, et al, Chapter 4; 4c. Alexander and Millington, Chapter 17.

**Written Assignment:** Project Proposal Concept due today.

**CLASS 5 (10/6)**

**Discussion Topic:** Integrating Vector and Raster Data - Working with Remotely-Sensed Imagery

**Lab Work:** Assignment #4: Lab Demo - "Re-projecting and Editing Spatial Data for Integration with Remotely-Sensed Images."

**Reading Assignment:** 5a. Johnston, Chapter 9; 5b. Bettinger and Wing, Chapter 13.

**CLASS 6 (10/13)**

**Discussion Topic:** Topographic Operations

**Lab Work:** Assignment #5: “Identifying Snail Habitat and Management Options in the Black Hills of South Dakota: Using Spatial Analyst to Conduct Optimal Location and Proximity Analyses.”


**CLASS 7 (10/20)**

**Discussion Topic:** Environmental Modeling in GIS

**Lab Work:** Assignment #6: Lab Demo - “Using Model Builder in Arc GIS to Assess Groundwater Conditions.”

**Reading Assignment:** 7a. Johnston, Chapter 10; 7b. Goodchild, Chapter 31; 7c. Clarke et al, Chapter 10.
CLASS 8 (10/27)

**Discussion Topic:** Methods of Interpolation, and Spatial Statistics  
**Lab Work:** Lab Assignment #7: "Interpolating to Create a Surface From Points Using Inverse Distance Weighting: Siting a Solar Energy Facility Based on Slope, Aspect, and Distance."

**Reading Assignment:** 8a. O’Sullivan, Unwin, Chapter 2; 8b. Chang, Chapter 13.  
**Written Assignment:** Draft Project Proposal Paper due today.

CLASS 9 (11/3)

**Discussion Topic:** Spatial Decision Support, Expert Systems, and Rule-Based Reasoning  
**Lab Work:** Assignment #8: "Developing and Implementing a Simple Environmental Model: Calculating Stream Sedimentation by Erosion Modeling."


CLASS 10 (11/10)

**Discussion Topic:** Error Analysis, Data Uncertainty, and Model Calibration  
**Lab Work:** Assignment #9: "Predictive Modeling for Habitat Suitability: Using a Logistic Regression Model to Locate Optimal Release Sites for Wolves."

**Reading Assignment:** 10a. Berry, Topic #4; 10b. Alexander and Millington, Chapter 7.

CLASS 11 (11/17)

**Discussion Topic:** Modeling and Public Policy, Ethics in GISc, and Participatory GISc  
**Lab Work:** Assignment #10: "Creating an Event Layer from X, Y Coordinates to Conduct a Density Analysis: Earthquake Risk Patterns in California."


CLASS 12 (11/24)

**Discussion Topic:** Applications of Quantitative and Qualitative Analyses for Urban Environmental Problems  
**Lab Work:** Complete Assignment #10  

(Note: 12b and 12c are on the GISc Lab server, not in course reader)

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**CLASS 13 (12/1)**

**Discussion Topic:** Student Project Proposal Presentations and Course Review  
**Lab Work:** Assignment #11: “Modeling Bauxite Thickness and Volumes in Jamaica.”  
**Reading Assignment:** Course reading material review.  
**Written Assignment:** Final Project Proposal Paper due today.

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**CLASS 14 (12/8)**

**Discussion Topic:** Student Project Proposal Presentations  
**Lab Work:** Complete Lab Assignment #11.  
**Written Assignment:** Take-home Final Exam to be distributed today.

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**CLASS 15 (FINAL EXAM WEEK)**

Final Exams Due, 12/15 at 6:00 PM

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**Project Proposal Paper:**  
Each student will individually develop a term paper detailing a GISc project proposal for independent research. This is to be a realistic project, one feasible of being carried out by you for an independent study course, such as GEH 490/GEP 690/EES 79904, Workshop in GISc Research. In Class 4, you will submit a brief (one or two paragraphs) synopsis of your project concept, which I will comment on and return to you. This should be developed further in the next few weeks into a full draft, which should include: the title of the project; the purpose of the project (hypothesis, problem to be solved, etc.); brief background of the issues; the data sets required; the methodology to be used; the flow chart of GIS operations; the data sets that have been acquired or located; any preliminary mapping carried out; and what further research may stem from this project; a literature review of related projects done previously; an outline of your search for relevant data; and a rough draft of a project flow chart. This first draft of your paper is due in Class 8, and will be returned with comments. The final project proposal paper is due in Class 13, and should contain about 3,000-5,000 words.

**Student Project Proposal Presentation:**  
Each student will individually prepare and make an oral presentation to the class of his/her project proposal research and resulting paper. The presentations will be made in Classes 13 and 14, and are each to be 10 minutes in length. The presentations should cover the following topics: the title of the project; the purpose of the project (hypothesis, problem to be solved, etc.); brief background of the issues; the data sets required; the methodology to be used; the flow chart of operations; the data sets that have been acquired or located; any preliminary mapping carried
out; and what further research may stem from this project. Oral presentations can be made using PowerPoint slides, relevant Internet sites, ArcMap layouts, or any other visuals.

**Student Preparation:**

**NOTE:** Students in GEP 350/GEP 605/EES 79904 have varying levels of GIS skills and background knowledge. To ensure as far as possible that everyone is "on the same page," and to minimize the effort required to understand the topics of spatial analysis, simulation, and modeling to be covered in this course, students are urged to review the following material, especially as necessary to supplement any known or potential area of deficiency.

All students will be expected to have a grasp of the rudiments of map composition and graph design, a familiarity with general GIS theory, a reasonable understanding of basic statistics, and a working knowledge of ArcGIS software and Windows operating system.

For general information on thematic mapping, map composition, and chart design, review *Cartography: Thematic Map Design*, by Borden Dent, 1999 (or latest edition), McGraw Hill, New York, NY. See especially Chapters 13, 14, 15 and 18, regarding map composition, use of color, typeface selection, and graphing, and Chapters 4, 5, and 7, regarding thematic mapping. Chapter 6 is an excellent overview of GIS. This book is available on reserve at the Lehman Library. Another good one on the topic is *Cartography: Visualization of Spatial Data*, by M.J. Kraak and F.J. Orneling, 1996, Pearson Education Ltd. Harlow, UK.


**GISc Lab Etiquette:**

The GISc Lab is available ONLY to students enrolled in GISc courses (and other EGGS Dept. courses at Lehman College and EES courses through the Graduate Center). Please be considerate of others when working in the lab. There is no eating or drinking allowed in the lab at any time, and no cell phone use, either. Please be respectful of other students trying to concentrate, and keep idle chatter to a minimum. When you arrive at the lab, sign in on the sign-in sheet. This is very important in order to demonstrate that students are actually using the lab. Do not save your work to the desktop or hard drive of the computer: it will not be saved after you shut down the computer. Save your work (often!) to a flash drive which you should bring to class every time. When doing lab work for class, please make sure your map layouts are exactly the way you want them before printing anything out. You will be allowed one test print and one final print of each lab exercise. Understand that replacement cartridges for the laser printer cost over $1,000, and our annual departmental budget for supplies is not much more than that! And no printing of any text material or Internet pages is permitted from the lab printer. Please save any materials that you want to print to your flash drive, and print them at home or elsewhere. At the end of your lab session, please shut down your computer and clean up your workstation area.

The lab is open every weekday and several evenings, (the lab schedule will be posted by the second week of the term) and the GISc Lab manager and GISc lab tutor will be available during some of those hours to help you, if you get stuck. They are NOT to be considered a
substitute for learning the software and methods on your own, however, so you must still try to figure things out and not become overly reliant on others for help. And although collaborative work with your classmates is encouraged as a good way to accelerate the learning process and reinforce concepts, we expect individual work products for lab exercises and written assignments.

**Course Guidelines and Groundrules:**

- Students are expected to be punctual and regular in attendance to class. Lateness, early leavings, and absences will be noted on the attendance sheets.
- Plagiarism of any source, or copying from the Internet, without proper attribution of author, is a serious breach of academic integrity, and will result in disciplinary actions. The statement on Academic Integrity and Plagiarism Policy can be found in student handbook. For more information refer to [http://www.lehman.cuny.edu/student-affairs/documents/student-handbook-02.pdf](http://www.lehman.cuny.edu/student-affairs/documents/student-handbook-02.pdf)
- All individual written assignments are to be typed on a typewriter, word processor, or computer, with 10 or 12 point type, double or 1.5 spacing between lines, and 1” margins all around. Hand written work will not be accepted.
- Assignments must be handed in on the due date. If you are not able to come to class the day an assignment is due, it is your responsibility to contact me to let me know that you will not be in class, and you must still get the work to me by the due date, by Fax, e-mail, etc.
- Late assignments will not be accepted, unless approved by me IN ADVANCE of the due date, and only if due to medical or family emergency. Poor time management skills are NOT a valid excuse for late assignments.
- Exchange phone numbers with at least two other students in the class. If you miss a class, it is your responsibility to contact another classmate to get the work you missed, including notes, new assignments, etc. Absence from class will not be a valid excuse for ignorance.
- Use the syllabus – there’s a lot of valuable information in it. You are expected to know when assignments are due, and what readings are to be done for which class. All this is written down for you in the syllabus.
- Please, no cell phones, beepers, or other auditory distractions in class.
- A grade of “Incomplete” for this course will ONLY be granted in case of a medical or family emergency, discussed with me IN ADVANCE of the Final Exam.
- Failure to turn in the Final Exam on time will result in a grade of “F” for the course, not an “Incomplete.”
- When in doubt about anything above, COMMUNICATE WITH ME. I have been known to be QUITE REASONABLE in working things out with students.
- Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more information, please contact the Office of Student Disability Services, Shuster Hall, Room 238, phone number, 718-960-8441.