Applications of Geographic Information Systems

Syllabus, Fall 2013
Tuesdays 18:30-22:15, ISEGI Room 2
Alan Glennon

Prerequisites: None
Credit Units: 7.5 ECTS
Office: ISEGI, 2nd Floor, Room 7
Contact e-mail: aglennon@isegi.unl.pt
Office Hours: Tuesday 15:30-17:30 or by appointment. ISEGI Second floor, Room 7.

COURSE DESCRIPTION

The capabilities and limitations of contemporary Geographic Information System software will be explored. Modern methods for geospatial data input, management, analysis, and output will be reviewed and performed via in-class and take-home software exercises. The application of GIS software is intended to reinforce conceptual and theoretical topics presented in other geospatial courses, increase student geospatial technical skill sets, and bolster student problem-solving agility and ability.

COURSE PROGRAM

- GIS Functionality: data input, management, analysis, and output
- Geospatial data representations
- GIS Analysis: Comparison, Process modeling, Optimization, Simulation
- Geospatial project workflows, design, and management
- Collaboration tools and techniques for data collection, project management, technique development, and support
- Geospatial data storage and transformation
- Mobile Platforms for Geospatial Data Collection and Analysis
- Visualizing Geospatial Data
- Web-based GIS
- GIS Service Publishing
- Network analysis and optimization
- Introduction to tools for addressing 3D, temporal, “big”, and social data

COURSE OBJECTIVES

- Recognize modern GIS capabilities and appropriate tools for geospatial problem solving. To be familiar with a wide range of analytical operations available within GIS. *Know what GIS does.*
- Design multi-step GIS workflows that solve geospatial problems. *Be able to solve complex problems.*
- Identify limitations of GIS software with respect to geospatial problem solving. *Know GIS shortcomings.*
- Recognize impacts of workflow decisions on data collection, management, analysis, and output (e.g., time for completion, accuracy, and bias). *Know the impact of your workflow decisions.*
- Automate tasks via scripting, external library integration, data transformation, or other customization. *Be able to extend standard GIS capabilities.*
- Identify and engage tools and methods for GIS project collaboration.
- Design and execute a GIS-centric software project from data collection, management, analysis, output, to publication.

COURSE FORMAT

Discussion, Lecture, In-class GIS exercises, Take-home GIS homework, Student Presentations, and a Final Project (GIS Service and Demonstration).

READING MATERIALS

- Textbook (Full text is free online as html or a downloadable pdf at: http://spatialanalysisonline.com):

  de Smith, M. J., M. F. Goodchild, et al. (2013). Geospatial Analysis: A Comprehensive Guide to Principles, Techniques and Software Tools. 4th edition, Leicester, United Kingdom, Winchelsea Press.

- Other materials: Links and documentation via course homepage.

EVALUATION

Individual GIS exercises completed in-class for eight of the twelve weeks. The exercises reinforce the tools, techniques, and topics of the class lecture and discussion. Students may assist one another in class to complete these assignments, but each student is expected to submit original, independent work. (8 assignments = 25%)

Individual GIS labs, four in total, completed as take-home assignments. These labs are assigned in class and due the subsequent week. Students may collaborate on labs, but must submit independent and original work. (5 assignments = 25%)

Group semester project. Working in teams of two and three students, improve the online UNL Campus Map. Any new data and services must be well documented, and include a commentary on maintenance requirements for future map administrators. The project culminates in a presentation and demonstration during the final weeks of class. For the final project presentation: one student demonstrates the service or data improvements; one student discusses infrastructure and how the product was made; for groups with third members, a student discusses ongoing maintenance requirements and areas for future improvement. (20%)

Status reports on the semester project submitted online by each student, as assigned, prior to the subsequent class. Seven progress reports (8 assignments = 25%)

Class participation is expected of every student via attendance, prompt arrival, discussion, and online interaction. (5%)

GRADING METRICS

- Completeness of assignment specifications
- Demonstrated application competency (correctness)
- Aesthetic
- Creativity
- Clearly communicated assignment submissions
- Demonstrated critical thinking
- Promptness (full credit for on time work; 10% reduction per day and no late work after 5 days)

COURSE OUTLINE

Tuesday, 10 September 2013, 18:30-22:15 -- Introduction; GIS Basics and Workflows
Tuesday, 17 September 2013, 20:30-22:15 -- GIS Operations and Problem Solving
Thursday, 19 September 2013, 20:30-22:15 – Editing and Automating Tasks
Tuesday, 24 September 2013, 18:30-22:15 -- VGI, Community, and Collaboration
Tuesday, 1 October 2013, 18:30-22:15 -- Data Sources and Management
Tuesday, 8 October 2013, 18:30-22:15 -- Mobile Platforms and Data Collection, part 1
Tuesday, 15 October 2013, 18:30-22:15 -- Mobile Platforms and Data Collection, part 2
Tuesday, 22 October 2013, 18:30-22:15 -- Visualizing Geospatial Data
Tuesday, 29 October 2013, 18:30-22:15 -- GIS Services and Publication
Tuesday, 5 November 2013, 18:30-22:15 -- Project Progress and Hackathon
Tuesday, 12 November 2013, 18:30-22:15 -- Networks and Optimization
Tuesday, 19 November 2013, 18:30-22:15 -- Where Next? 3D, Big Data, Mobile, and Social
Tuesday, 26 November 2013, 18:30-22:15 -- Student Projects Demonstration and Discussion

ACADEMIC CONDUCT

(modified from a document by Dr. Sara Fabrikant, ETH-Zurich, and combined with elements of the NOVA document: “Good Practice in PhD Education at Universidade Nova de Lisboa)

Cheating, plagiarism and other academic dishonesty are an assault upon the basic integrity and meaning of a University.

Cheating is the unauthorized use of information or study guides in any academic exercise.

Plagiarism is academic theft, or the act of using someone else's words, pictures, ideas, or procedures without proper acknowledgement, or to present them as if they originated with you.

The same codes of conduct apply also for the computing environment. For example, going into someone's computer account and copying files without their permission or taking any material off the Web and using it as if it was your own is not only unethical, but illegal in many nations.

Students should be aware that “self-plagiarism” is also not acceptable. In self-plagiarism, authors reuse their own previously written work or data in a “new” written work without letting the reader know that it has appeared elsewhere. The reproduction of material which was used in other work or course assessment is also considered self-plagiarism.

In other situations, particularly learning situations, it is possible that students who do not know the protocols of academic expression can inadvertently plagiarize. In some cultures, direct use of another person's words brings great honor to the quoted person. In this University, plagiarism constitutes a form of cheating, and will not be tolerated. If you are unsure whether to cite someone else's work (including the Web) as your work through an assignment, come talk to the Professor about it.

Concerns research ethics in general and plagiarism in particular, Universidade Nova de Lisboa endorses the guidelines of the European Code of Conduct for Research Integrity (European Science Foundation).