## Geospatial Methods

M: 2:00PM – 5:00PM 3 credit hours

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May, 2010

**Course Level:** graduate/undergraduate

**Course Description:** The class introduces concepts, theories, and techniques in geospatial methods, and principles of spatial analysis, and data mining with integration of GIS, remote sensing and GPS. Varies applications of the techniques are also discussed with special attention on its applications in environmental studies such as risk assessment and mitigation, environmental modeling, resources exploration, natural resource management, air-pollution & control, forest fire management.

**Prerequisites:** None.

**Attendance Policy:** Attendance is expected at every course meeting, particularly for the lab work.

**Course objectives:** Completing this course, students will:

* Familiar with geospatial technology and the methods used to derive information from spatial data.
* Familiar with geoprocessing techniques such as spatial autocorrelation, sampling, georeferencing, interpolation, and associated uncertainties with them.
* Be able to perform spatial modeling using varies data sources, and produce geostatistical summaries from spatial data.
* Carrying out optimization studies to identify desired point locations and routes.
* Understand how to integrate remote sensing and GPS into GIS for data mining, effective maintaining and updating of organizational databases.
* Familiar how to use GIS and geospatial methods to solve their own research problems.

**Topical Outline and Schedule:**

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| **Week** | **Lecture, Lab/Software Demonstration, Homework & Reading, Quizzes**  |
| **#** | Starts on | Topics/Goals/Discussions |
| 1:  |  | **Lecture**: GIS & Geospatial Methods: course overview, GISscience, systems, software, data |
| 2:  |  | **Discussion1**: GIS around us, applications & techniques **Lecture**: Geographic representation: geographic objects (discrete & continues), data models (raster & vector), maps  |
| 3:  |  | **Lecture**: The nature of geographic data: spatial relationships (topology and spatial correlation), sampling, and uncertainty. **Quiz1:**  |
| 4: |  | **Lecture**: Map projections, coordinate systems and datums. **Quiz2:** |
| 5: |  | **Lecture**: Raster geoprocessing**Quiz3:** |
| 6:  |  | **Lecture**: Geodatabases I **Discussion2**: Designing a geodatabase |
| 7:  |  | **Lecture**: Geodatabases II**Quiz4:** |
| 8:  |  | **Lecture**: Web GIS: map server, server GIS administration and security solutions. (A PAGE Project PROPOSAL DUE) |
| 9:  |  | ***Spring Break*/Fall Break** |
| 10: |  | **Lecture**: Vector geoprocessing I: query and measurement, transformation and descriptive summaries (including buffer and overlay analysis, spatial interpolation, density estimation, geostatistics).  |
| 11:  |  | **Lecture**: GPS mapping and GIS integration  |
| 12:  |  | **Lecture**: Vector geoprocessing II: spatial modeling & optimization. **Quiz5:**  |
| 13:  |  | **Lecture**: Remote sensing for GIS applications I: Remote sensing basics, data mining and geopspatial analysis using remote sensing and GIS.  |
| 14:  |  | **Lecture**: Remote sensing for GIS applications II: pushing remote sensing derived vector/raster results into GIS workflow |
| 15:  |  | **Lecture**: Geospatial methods and case studies: detecting submarine springs in coastal areas  |
| 16:  |  | Project presentations |
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**Class Project:**

Students are expected to choose a topic that involves some aspects of GIS and geospatial methods. You may work alone or in groups of two. You may use your class project as an opportunity to conduct a pilot study that can enhance your own thesis research. Each student will present the project at the end of the semester. Students must submit a one page project prospectus that includes the objective, type of geospatial methods to be used, data sources, and expected final products. As a primary investigator of your class project, you will be responsible for overall design, implementation and completion of your project.

**Discussions:**

Graduate students are expected to lead group discussions and actively participate. Undergraduates are not required to lead discussions, but supposed to participate. The most of the discussion topics will be chosen according to students' interest and ongoing class project.

### Academic Integrity and Honesty

Students are expected to be honest in their academic work. The University reserves the right to penalize any student whose academic conduct at any time is, in its judgment, detrimental to the University. Such Conduct shall include cases of plagiarism, collusion, cheating, giving or receiving or offering or soliciting information in examinations, or the use of previously prepared material in examinations or quizzes. Violations should be reported to your course instructor, who will investigate and adjudicate them according to the Policy on Academic Honesty of the College of Arts and Sciences. If the charges are found to be true, the student may be liable for academic or disciplinary probation, suspension, or expulsion by the University.

Please review the Graduate School Academic Integrity and Academic Honesty policy (see http://academicintegrity.slu.edu/).

### Students with Special Needs - Disability Services

Any student who feels that he/she may need academic accommodations in order to meet the requirements of this course—as outlined in the syllabus, due to presence of a disability, should contact the Office of Disabilities Services. Please telephone the office at 314-977-2930, or visit Room 131 in the Academic Resources Center, 3840 Lindell Blvd. Confidentiality will be observed in all inquiries.

**Grading:** Grading uses the 0-100 point scale.

The course grade will be determined by adding together the scores from the pre-class reading, quizzes, and lab exercises according to the percentages described in the Course Requirements of the syllabus. There will be no exceptions.

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| **Grade Breakdown:** | **Grade Scale:** |
| 30% - Lab assignments  (10×3) | A (≥ 93 points) |
| 10% - Discussions (5×2) | B+ (90 – 92 points) |
| 08% - Project proposal | B (83 – 89 points) |
| 10% - Project Abstract  | B- (80 – 82 points) |
| 10% - Project presentation  | C (73 – 79 points) |
| 25% - Quizzes (5×5) | F (≤ 72 points) |
| 07% - Attendance |  |