GIS 415 Spatial Analysis
Spring 2016

Instructor: Dr. Daniel G. Scognamillo
Office: Forestry 203E
Phone: 468-5993
Email: dgscognamillo@sfasu.edu
Office Hours: Mon 08:00 AM-11:00 AM
Wed 08:00 AM-11:00 AM
Thu 08:00 AM-12:00 PM
Also by appointment

Lectures: Mon and Wed 11:00-11:50 FOR 208
Labs: Wed 12:00 - 2:50 (location TBD)

Course Description

This course is intended to acquaint students with the most current spatial analysis techniques used in the identification and description of spatial patterns in spatially referenced data.

Course Objectives

Upon completion of the course, students should:
- Understand concepts and application of basic analyses used in spatially referenced data.
- Be able to recognize and implement appropriate methodology and analysis to address research questions with a spatial component.
- Understand the scientific method as applied to scientific research in spatial sciences, including problem formulation, data collection, and data analysis.

Program Learning Outcomes

The course is designed to address the following Program Learning Outcomes, as given in the Bachelor of Science in Forestry Program Matrix:

1. Demonstrate understanding and competency of forest ecology and biology;
2. Demonstrate understanding and competency in the measurement of forest resources;
3. Demonstrate understanding and competency in managing forest resources;
4. Demonstrate understanding and competency of forest resource policy, economics, and administration.
5. Demonstrate understanding and competency in oral and written communication skills.

Items #1 - #4 above are required by the Society of American Foresters, the program’s accrediting agency.

B.S. Forestry Program Learning Outcomes
Proficiency Levels

<table>
<thead>
<tr>
<th>Forestry Common Core</th>
<th>PLO 1</th>
<th>PLO2</th>
<th>PLO3</th>
<th>PLO4</th>
<th>PLO5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GIS 415</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Items #1 - #4 above are required by the Society of American Foresters, the program’s accrediting agency.
**Student Learning Outcomes**

Upon completion of the course, students will:

a. Foundational knowledge.
   - understand of the most current techniques in spatial analysis.
   - understand of major concepts related to the design and implementation of scientific research.
   - formulate valid criteria for the selection of the appropriate techniques to address specific goals in natural resources research.

b. Application.
   - find information on and analyze current spatial science issues.
   - identify current knowledge gaps and needs in spatial science.

c. Integration.
   - identify the interactions between spatial science and other realms of knowledge.

d. Human dimension.
   - identify ways in which one's or someone else's personal life could affect or be affected by implementation of spatial analysis and description of spatial patterns.
   - intelligently discuss important issues in spatial science with other professionals.

e. Future learning.
   - be familiar with a number of popular spatial science journals and other sources of knowledge about spatial science analysis.
   - have some specific ideas about what other knowledge would be desirable to have about new spatial analyses or improvement for current ones.

**Grading**

Grades in this class will be based on a combination of exams, lab reports, and a special project.

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab reports</td>
<td>300</td>
</tr>
<tr>
<td>Special project</td>
<td>300</td>
</tr>
<tr>
<td>Mid-term exam</td>
<td>200</td>
</tr>
<tr>
<td>Final exam</td>
<td>200</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1000</td>
</tr>
</tbody>
</table>

Course grades will be given according to the following scale:

A = 90-100 %
B = 80-89 %
C = 70-79 %
D = 60-69 %
F = 0-59 %

**Textbook**


**Written Assignments**
- **Lab reports**: each student will be responsible for completing each lab and turning in a report due at the beginning of the following lab. All reports must be typed and electronic submitted via D2L (dropbox) by the due date for full credit; late submissions will not be accepted.

- **Special project**: Students will be responsible for developing a research project during the semester using techniques learned in class. Faculty will provide a data set that the students will use for the project. Within the first 3 weeks of classes students will write a 2-page proposal outline where they explain motivations and justification for the research and the significance of potential findings. Once the research is complete, students will give an oral presentation where they will highlight analyses used and main findings.

**Exams**
Two formal written exams (one midterm, one final) are scheduled for the semester. Each exam will cover concepts covered in lectures (theory) and applications in lab. Topics included in each exam will be announced by the faculty. Final exam is cumulative.

**Responsible Use of Technology**
It is expected that all students will only use cell phones, PDAs, laptop computers, MP3 players and other technology outside of class time or when appropriate in class. Answering a cell phone, texting, listening to music or using a laptop computer for matters unrelated to the course may be grounds for dismissal from class or other penalties.

**Classroom Behavior**
Disruptive, distracting, or disrespectful behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic, or other penalties. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom.

**Other policies**
All of the students in this class and in the Arthur Temple College of Forestry and Agriculture are expected to conduct themselves in an ethical and professional manner. For professionals in natural sciences, the Ecological Society of America has established a Code of Ethics to which these professionals are expected to adhere. I strongly encourage you to read and abide by these guidelines, available at [http://www.esa.org/aboutesa/codeethics.php](http://www.esa.org/aboutesa/codeethics.php).

**Academic Integrity (A-9.1)**
Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

**Definition of Academic Dishonesty**
Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to 1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; 2) the falsification or invention of any information, including citations, on an assigned exercise; and/or 3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are 1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; 2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and 3) incorporating the words or ideas of an author into one's paper without giving the author due credit.

Please read the complete policy at [http://www.sfasu.edu/policies/academic_integrity.asp](http://www.sfasu.edu/policies/academic_integrity.asp)

**Withheld Grades Semester Grades Policy (A-54)**
Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

**Students with Disabilities**
To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices/

**Lecture and lab topics**
These are proposed topics to be covered during the semester. In order to improve the learning experience of students in the class, and the increase the probability of achieving the Student Learning Outcomes, the professor reserves the right to modify the order in which topics are presented, and to modify this list by adding or deleting topics as the semester progresses.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spatial analysis and spatial data analysis.</td>
</tr>
<tr>
<td>2</td>
<td>Population and samples. Sampling and sampling design.</td>
</tr>
<tr>
<td>3</td>
<td>Descriptive statistics and interpretation. Working with categories</td>
</tr>
<tr>
<td>4</td>
<td>Statistics, interpretation, and test of significance.</td>
</tr>
<tr>
<td>5</td>
<td>Preliminary data analysis. Graphical representation. Mapping Quantities. Choosing classes. Working with charts</td>
</tr>
<tr>
<td>6</td>
<td>Density analysis. Dot density maps and density surfaces.</td>
</tr>
<tr>
<td>7</td>
<td>Quantifying nearness. Distance surfaces. Cost and nearness along networks. Mapping change (location and magnitude)</td>
</tr>
<tr>
<td></td>
<td>Midterm Exam</td>
</tr>
<tr>
<td>8</td>
<td>Measuring geographic distributions. Centers and weighted centers. Variation and direction.</td>
</tr>
<tr>
<td>10</td>
<td>Spatial autocorrelation. Hot-spot analysis.</td>
</tr>
<tr>
<td>11</td>
<td>Spatial autocorrelation. Hot-spot analysis.</td>
</tr>
<tr>
<td>12</td>
<td>Spatial Regression Modeling. Linear models. Simple linear regression.</td>
</tr>
<tr>
<td>13</td>
<td>Autocorrelation. Geographically Weighted Regression (GWR).</td>
</tr>
<tr>
<td>14</td>
<td>Autocorrelation. Geographically Weighted Regression (GWR).</td>
</tr>
<tr>
<td></td>
<td>Final Exam</td>
</tr>
</tbody>
</table>