Please indicate:  __X__ NEW  ____ MODIFY  ____ DELETE

Local Unit: SCS  Graduate Council Approval Date:

Course Designation: EOS  Course Number: 791

Full Course Title: Advanced Spatial Statistics

Abbreviated Course Title (24 characters max.): Advanced Spatial Statistics

Credit hours: 3  Program of Record: ESS M.S., CSI Ph.D.

Repeatable for Credit?  ___ D=Yes, not within same term  Up to hours
                          ___ T=Yes, within the same term  Up to hours
                          _X_ N=Cannot be repeated for credit

Activity Code (please indicate):  _X_ Lecture (LEC)  ____ Lab (LAB)  ____ Recitation (RCT)
                                      ___ Studio (STU)  ____ Internship (INT)  ____ Independent Study (IND)  ____ Seminar (SEM)

Catalog Credit Format  3: 3: 0  Course Level: GF(500-600)  ____ GA(700+)  _X_

Maximum Enrollment: 20  For NEW courses, first term to be offered: F04

Prerequisites: GEOG 585 or STAT 535/554, or Permission of Instructor

Catalog Description (35 words or less): This advanced course focuses on analyzing geo-referenced or spatial data represented as points or polygons. Higher moments, point pattern analyses, and interpolations of points to surfaces will be addressed. Spatial regression will also be included.

For MODIFIED or DELETED courses as appropriate:
Last term offered:  Previous Course Abbreviation:  Previous number:

Description of modification:

APPROVAL SIGNATURES:
Submitted by:  ________________________________ email: ________________
Department/Program:  ________________________________ Date: ________________
College Committee:  ________________________________ Date: ________________
Graduate Council Representative: ________________________________ Date: ________________
Approval from other units:

Please list those units outside of your own who may be affected by this new, modified, or deleted course. Each of these units must approve this change prior to its being submitted to the Graduate Council for approval.

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<th>Unit:</th>
<th>Head of Unit’s Signature:</th>
<th>Date:</th>
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Graduate Council approval: ___________________________________________ Date: __________

Graduate Council representative: _________________________________________ Date: __________

Provost Office representative: __________________________________________ Date: __________
Course proposal to the Graduate Council
by
The School of Computational Sciences

1. COURSE NUMBER AND TITLE:

EOS 791 Advanced Spatial Statistics

Prerequisites: GEOG 585 or STAT 535/554, or Permission of Instructor

Catalog description: This advanced course focuses on analyzing geo-referenced or spatial data represented as points or polygons. Higher moments, point pattern analyses, and interpolations of points to surfaces will be addressed. Spatial regression will also be included.

2. COURSE JUSTIFICATION

Course objectives: The purpose of this course is to introduce advanced geostatistical methods and spatial regression techniques to handle spatial or georeferenced data. Spatial data possess unique properties and characteristics that classical or mainstream statistical tools may fail to handle and analyze them effectively and correctly. This course will focus on several types of advanced geostatistics and spatial statistics. They can be generally categorized into techniques analyzing point data and polygon data. For analysis of point data, the emphases will be on more advanced point pattern analytical methods and spatial interpolation techniques. For analysis of polygon data, we will focus on spatial regression models.

Course necessity: Spatial data possess special properties that classical statistics may fail to analyze the data properly. In addition, questions being asked about spatial data are different from other data, such as location questions. Given the widely used of spatial data (remote sensing and GIS data) in SCS (and in Geography), it is important to address this issue. There is no formal advanced course focusing on the analysis of spatial data in the entire campus.

Course relationship to Exiting Programs: This course will serve as an elective mainly for students in MS in ESS and Ph.D. in CSI in the Earth Observing track. Other CSI students interested in spatial data analysis can also benefit from this course. It will also serve advanced students in Geography.

Course relationship to Other Existing Courses: There is no similar course in SCS. The one closest to the proposed course is GEOE 585, which is an introductory course mainly for MS students. The proposed course is built upon GEOG 585. The course will also serve as an elective for MS in Statistical Science.

3. APPROVAL HISTORY

4. SCHEDULING AND PROPOSED INSTRUCTORS

Semester of Initial Offering: Fall 2004

Proposed instructors: Dr. David Wong, Dr. James Gentle, Dr. Daniel Carr, and Dr. Sergei Andronikov

5. TENTATIVE SYLLABUS: See attached.
The purpose of this course is to introduce advanced geostatistical methods and spatial regression techniques to handle spatial or georeferenced data. Spatial data possess unique properties and characteristics that classical or mainstream statistical tools may fail to handle and analyze them effectively and correctly. This course will focus on several types of advanced geostatistics and spatial statistics. They can be generally categorized into techniques analyzing point data and polygon data. For analysis of point data, the emphases will be on more advanced point pattern analytical methods and spatial interpolation techniques. For analysis of polygon data, we will focus on spatial regression models. By finishing this course, students should acquire a reasonable skill set to statistically analyze spatial data captured as points and polygons. This skill set is essential in conducting empirical research on geography, earth sciences, and the use of GIS and remote sensing technology. A basic understanding of spatial data analysis, preferably GEOG 585 is a prerequisite for this course.

Text:

Topics:
1) Review
   - properties of spatial/georeferenced data
   - simple point pattern analyses
   - measuring spatial autocorrelation
2) Advanced Point Pattern Analysis
   - Kernel density estimation
   - K-function analysis
3) Spatial Interpolation Techniques
   - Spatial autocorrelation and variograms
   - Deterministic spatial interpolation techniques
   - Statistical spatial interpolation techniques
     i. Simple kriging
     ii. Ordinary kriging
     iii. Universal kriging
     iv. Co-kriging
4) Spatial Regression Models
   - Trend surface modeling
   - Spatial weights matrix specifications
   - Spatial autoregressive models

Grading policy:
<table>
<thead>
<tr>
<th>4 exercises</th>
<th>50 pts (they are not equally weighted)</th>
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<tr>
<td>Project</td>
<td>50 pts</td>
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<td><strong>Total</strong></td>
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