

Syllabus: EES 214 – Advanced Spatial Analysis

CALIFORNIA STATE UNIVERSITY, FRESNO
Advanced Spatial Analysis
Academic Department Office Location:
Science II, Room 121
Department of Earth and Environmental Sciences
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Course Information	Instructor Information
Course No: EES214	Instructor: Xiaoming Yang, PhD
Units: 3	Email: xmyang@csufresno.edu
Prerequisite: Introduction to GIS	Online Office Hours via <i>Illuminate Live!</i> Mon. & Wed. 9-11:30am

Basic Course Information:

This is a 3-unit online course to be learned at any time during the offering period. The course materials are available through Blackboard (login using your CSUF e-mail passwords) Information for the entire class will be posted on announcements weekly, or more often if necessary. For personal questions, students may email the instructor directly. When writing an E-mail to the instructor, be sure to write "EES214-LastName-Initial and question, otherwise the email will be deleted as junk mail.

Response Times: The instructor will check and respond to email and the discussion board at least 2 days a week. Assignments will be graded, posted in the grade book and returned within the week of the due date.

Online office hours in ***Illuminate Live!*** may be accessed from course menu in Blackboard. A microphone is recommended for audio communication.

Catalog Description:

EES 214: Advanced Spatial Analysis

Prerequisites: EES 211 and 212. Spatial Analysis is an advanced course in GIS that exposes students to an array of spatial analysis theories, techniques and practices. Reading, demonstrations, applied assignments. Primarily asynchronous online.

Course Goals:

The goals of this course are to:

- Provide students with a comprehensive understanding of the theories, assumptions, and context of spatial analysis methods.
- Enable students to identify and apply the correct analytical tools for a problem solving, and
- Enhance students' ability to correctly and appropriately interpret and present the analysis results.

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Student Learning Outcomes:

Upon successful completion of the class, students should be able to:

- Critically evaluate, defend and apply spatial analytical methods.
- Design solutions for local, neighborhood, and regional analyses problems
- Design terrain analysis with 3D data types and derive analytical surfaces
- Generate linearly referenced features and incorporate them into GIS analysis
- Apply concepts of geo-statistical models to interpolate 3-dimensional data
- Design, build and defend a regression model and establish a regression analysis workflow
- Solve network problems by through network analysis
- Model geographic distributions
- Identify and interpret spatial patterns and clusters
- Analyze spatial relationships
- Evaluate and interpret spatial statistical results

Textbook:

M. de Smith, M. Goodchild, P. Longley; *Geospatial Analysis - a comprehensive guide*. 3rd edition © 2006-2009; Published by Matador (an imprint of Troubador Publishing Ltd) on behalf of The Winchelsea Press; ISBN 13: 9781848761582; Free web version site: [Spatial Analysis site \(http://www.spatialanalysisonline.com/output/\)](http://www.spatialanalysisonline.com/output/)

Assignments:

There are a total of seven (7) ESRI web classes and four (4) ESRI training seminars to be completed. The web courses must be completed by the due date. A report on what have you learned from the seminar must be submitted after finishing the training seminar and submitted by the due date. Late completion of assignments will result in reduction of the grade by 10% per day for the first five days and will result no credit after the fifth day.

The first report covers two seminars: *Understanding Spatial Statistics* and *Introduction to Spatial Pattern Analysis*. The report should focus on

- Why use spatial statistics

The second report is based on the seminar *Geographically weighted Regression Analysis* and it should focus on

- Why regression analysis on is used with spatial data

Required Materials - Hardware and Software Requirements, Cost:

Each student must have access to a computer with a DVD drive and capable of running MS Windows-based software. The student bears the cost of hardware and Internet access. The minimum system requirements are:

- Operating system: Windows 2000 professional or higher
- CPU Speed: 1.6 GHz or higher
- Memory (RAM): 1 GB
- Free Disk Space: 5 GB
- Broadband Internet access

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- ArcGIS Desktop software, including the Spatial Analyst, 3D Analyst, Network Analyst, and Geostatistical Analyst extensions, will be provided at no cost to students. The software was supplied to students at the beginning of EES 211.

Evaluation Procedures:

- Grading:
 - Successful completion of all the exercises: 65%
 - Seminar reports: 10%
 - Participation in the class discussion 25%
- Grading scales:
 - 90-100% = A
 - 80-89% = B
 - 70-79% = C
 - 60-69% = D
 - Under 60% = F

Grading Rubric for ESRI web courses:

- Each web course is graded out of 5 points.
- 5-Completed web course and greater than 95% correct on the course evaluation
- 4- Completed web course and 90% to 94% correct on the course evaluation
- 3- Completed web course and 85% to 89% correct on the course evaluation
- 2- Completed web course and 80% to 84% correct on the course evaluation
- 1-Completed web course and <80% correct on the course evaluation
- 0-Incomplete web course

Grading Rubric for ESRI Training Seminar Reports:

- Each report is graded based on the following criteria.

Criteria	3	2	1
Introduction	Presents a concise lead-in to the question	Gives very little information or too much information--more like a summary	Does not give any information about what to expect in the report
Research	Focus on the question and includes many other interesting facts	Focus on question and includes a few other interesting facts	Does not focus on the question
Conclusion	Presents a logical explanation for findings and addresses most of the question	Presents a logical explanation for findings and addresses part of the question	Presents an illogical explanation for findings and does not address any of the question

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Grammar & Spelling	All grammar and spelling are correct	Only one or two errors	Very frequent grammar and/or spelling errors
Timelines	Report handed in on time	10% reduction per day	10% reduction per day

- Total points are summary of each criterion.

Grading Rubric for participation in the class discussion:

Criteria	3	2	1
Discussion	Answers to the online questions show a high degree of detail, accuracy and insight.	Answers to the online questions show some detail, accuracy and insight.	Answers to the online questions show limited detail, accuracy and insight.

- Total points are summary of each criterion.

Expectations:

Communications: The course is an online class; therefore, most of our interactions will be asynchronous. Three ESRI training courses and two seminars will be assigned in the class. ESRI classes are graded by the above criteria; a report (2 to 4 pages; double spaced; 12 pt font; 1" margins) is required for the two of the ESRI Training Seminars. The report must be submitted to the instructor via the Blackboard Assignment link.

Workload: Students should expect to spend 10-12 hours per week completing the work in this course.

Class discussion: Students are expected to participate in weekly discussion. A student is expected to post a minimum FIVE questions during the duration of the course. Each week a student is expected to respond to at least **ONE** question posted by the instructor or other students. All the questions and responses should be written in detail with accuracy and insight.

Resources:

This course will be presented through Blackboard where all course materials and online discussions will be hosted. If you find you are unable to access the Blackboard, first contact the [Technology Innovation for Learning and Teaching \(TILT\) webpage](http://www.csufresno.edu/tilt/index.shtml) at (<http://www.csufresno.edu/tilt/index.shtml>) or call the TILT blackboard resource center at 559-278-7373 Monday through Friday from 8:00am to 5:00pm. After hours, email TILT at dcfeedback@csufresno.edu or call 559-278-7000 seven days a week between 7:00am to 10:00pm. If there is still a problem contact the instructor.

The primary resource for the course is the textbook. For extra readings visit the [GIS and Science webpage](http://gisandscience.com/) (<http://gisandscience.com/>)

UNIVERSITY POLICIES:

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Students with Disabilities:

Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in the University Center Room 5 (278-2811).

Honor Code:

"Members of the CSU Fresno academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities." You should:

- a. understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration)
- b. neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.
- c. take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Instructors may require students to sign a statement at the end of all exams and assignments that "I have done my own work and have neither given nor received unauthorized assistance on this work." If you are going to use this statement, include it here.

Cheating and Plagiarism:

"Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For more information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations).

Computers:

"At California State University, Fresno, computers and communications links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Information Technology Services (<http://www.csufresno.edu/ITS/>) or the University Bookstore. In the curriculum and class assignments, students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources."

Disruptive Classroom Behavior:

"The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. ... Differences of viewpoint or concerns

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should be expressed in terms which are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop and understanding of the community in which they live . . . Student conduct which disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class."

Copyright policy:

Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its copyright web page:

<http://www.csufresno.edu/library/libraryinformation/campus/copyright/copyrtpolicyfull.pdf>

For copyright Questions & Answers:

<http://www.csufresno.edu/library/libraryinformation/campus/copyright/faqcopyright.pdf>

Tentative Course Schedule:

Week	Topic	Reading Assignment	Assignment
1	Introduction to course and review GIS fundamentals	Terminology/ Notation /Statistical measures and related formulas	Understanding Map Projects and Coordinate Systems exercise
2	Conceptual Frameworks for Spatial Analysis	Basic Primitives/ Spatial Relationships/ Spatial Statistics/ Spatial Data Infrastructure	
3	Spatial analysis Methodology	Spatial Analysis as a Process/ Analytical Methodologies/ Geospatial Analysis and Model Building	
4	Learning ArcGIS Desktop		Learning ArcGIS Desktop
5	Learning ArcGIS Desktop		Learning ArcGIS Desktop
6	Building Block of Spatial Analysis -- I	Spatial Data Models and Methods/Geometric and Related Operations/ Queries, Computations and	Geoprocessing exercise

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Week	Topic	Reading Assignment	Assignment
		Density	
7	Building Block of Spatial Analysis -- II	Distance Operations/ Directional Operations / Grid Operations and Map Algebra	
8	Data Exploration and Spatial Statistics -- I	Statistical Methods and Spatial Data/ Exploratory spatial Data Analysis/ Grid-based Statistics	Understand Spatial Statistics seminar Spatial Pattern Analysis seminar – report due on Monday of the ninth week
9	Data Exploration and Spatial Statistics -- II	Point sets and Distance Statistics/ Spatial Autocorrelation / Spatial regression	Geographically Weighted Regression Analysis seminar – report due on Friday of the tenth week
10	Surface and Field Analysis -- I	Modeling Surface/ Surface Geometry	Raster analysis exercise
11	Raster analysis exercise		Raster analysis exercise
12	Surface and Field Analysis -- II	Visibility / Watersheds and Drainage/ Gridding, Interpolation and contouring	Terrain analysis exercise
13	Terrain analysis exercise		Terrain analysis exercise
14	Surface and Field Analysis -- III	Deterministic Interpolation Methods/ Geostatistical Interpolation Methods	Geostatistical exercise
15	Network and Location analysis -- I	Introduction to Network and Location Analysis/ Key Problem in Network and Location Analysis	Linear Referencing exercise
16	Network and Location	Network Construction, Optimal Routes and	Using Network functions

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Week	Topic	Reading Assignment	Assignment
	analysis -- II	Optimal Tours / Location and Service Area Problems	seminar

This syllabus and schedule are subject to change. Adequate notice will be given to students. It is your responsibility to check Blackboard announcements to obtain this information.