OFFICIAL SYLLABUS WILL BE PROVIDED IN THE COURSE

EAST TENNESSEE STATE UNIVERSITY

College of Arts and Sciences

Department of Geosciences

GEOS 5350 Statistics for Geosciences

Instructor: Ingrid E. Luffman
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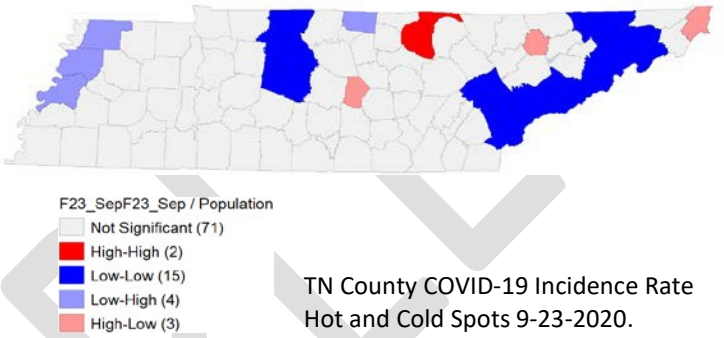
Office Hours: By appointment via zoom

Class Schedule: Mon/Wed 2:15-3:35 PM
Remote synchronous via zoom
Join URL: https://etsu.zoom.us/j/91258596861?pwd=UDFWU3FHV3RiMjMybm5Ea3ZkVS95dz09



TN County COVID-19 Incidence Rate Hot and Cold Spots 9-23-2020.

Course Overview: This course introduces students to data analysis. The emphasis is on finding solutions to inherently geographical problems (but note that most datasets can be analyzed using the tools presented in this class). This course is very practice-oriented. We will explore various real-world data sets using statistical software packages (e.g., SPSS, CrimeStat, GeoDa, R, and ArcGIS). This course requires no prerequisites, though some knowledge of basic statistical and mathematical concepts and familiarity with the Windows operating environment and ArcGIS is beneficial. This course combines lectures, reading material, and computer exercises in a lab format. Lectures precede labs and focus on the applicability and usefulness of each spatial statistic and how various software packages can be used to solve spatial problems. Labs demonstrate how these concepts are applied.

I want you to become responsible for your own education, and with this goal in mind, class time is structured so that you build skills in how to learn – with the ultimate goal that each student becomes a proactive self-directed learner. How?? Come to class prepared, identify which concepts have been mastered and which concepts are still 'muddy', and take action to 'de-muddify' difficult material.

Student Technology Competency: This course is technology intensive and will require use of technology as a tool for learning. It is your responsibility to familiarize yourself with the technologies in order to function independently in the course, these technologies include the ability to:

- Use a Web browser to access online content;
- Download files, unzip compressed files, and install software;
- Use basic features of word processing and spreadsheets (import text files, sort data, save files, clean up data and format for other programs, etc.);
- Use basic mapping and GIS tools (e.g., Google Earth, Google Maps, ArcGIS);
  - Basic data management skills within Windows operating system (e.g., manage and maintain files).
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Technology Support: The GIS lab is open various times throughout the day when another class is not being taught, however, access to the lab is very limited. Your best option, if you need access to specialized software like SPSS, is to log in to one of the lab computers remotely. I am working with ITS to set this up and hope to have all in place by the first day of classes. Note that the GIS help desk will also be staffed remotely, but regularly during the week. Once I receive a helpdesk schedule, I'll share it with you as this can be a great resource if you have ArcGIS Pro related questions. For technical support with a University related technical problem, contact the

Office of Information Technology (OIT) at http://www.etsu.edu/oit/ or contact them through their e-mail: shelpdesk@etsu.edu

Software:
SPSS access off campus –see instructions at https://www.etsu.edu/helpdesk/goldlab/remote-desktop-web-access.php
R download https://mirrors.nics.utk.edu/cran/
GeoDa download http://geodacenter.github.io/download.html
Crimestat IV download https://nij.gov/topics/technology/maps/pages/crimestat-downloads.aspx
ArcGIS Pro – access through your ETSU ArcPro account set up through Andrew Joyner. Let me know if you don't have this set up yet and I will help.

Class Requirements:
Labs (45%) - Labs provide students with hands-on exposure to statistical tools, programs, and techniques presented during lectures and in readings.

- Labs use software available in the computer lab. Instructions and user guides are provided for completing the labs in the allotted time. Students are expected to use the lab periods for guidance and assistance in completing the exercises.
- Labs may also include a reading assignment.
- Labs will have equal weight.

Project & Presentation (45%) – The term project is an analysis of a dataset using techniques covered in class (or other techniques as appropriate). You may use a dataset from your own research, a sample dataset or some other data. The project will consist of three phases.

- First (15%), a project proposal will be submitted, which includes a short literature review, a description of your dataset (and data sources), plus a section outlining your proposed methods (due following spring break). Students should meet with me in mid-February to discuss their proposed projects and analytical methods, and then check in with me in early March.
- Second (15%), the complete project will be written up in a short Extended Abstract (2-3 pages plus figures) that includes revised lit review, data description, and methods sections from the proposal, plus results, discussion, and conclusions sections.
- Third (15%), each student will present their results orally to the class.

Course contribution (10%) – this requirement captures your commitment to the class. Your grade is based on engagement, preparation, contributions to discussion, helpfulness, and collegiality.

Class Policies:

- Arrive in class on time and prepared (phones silenced, assigned readings done, ready to participate).
- Always ask questions!
- Progress beyond the basic points by filling in details using reference books, research papers, or other sources to make the course material relevant to your research.
- If you miss a class for any reason, you are responsible for any assignments and/or obtaining the information discussed in class. If you have a personal emergency and cannot meet a deadline, contact me as soon as you are able. I strive to treat graduate students as colleagues rather than subordinates, and will be as flexible as possible, so long as we are both working in good faith. Late assignments without prior arrangement will be assessed a 20% penalty and will not be accepted beyond 1 week from the due date unless prior arrangements are made. There is no extra credit policy.

- If you have a disability that may impact your work in this class and may require accommodations, please inform me and contact Disability Services at http://www.etsu.edu/students/disable/
- As a student at East Tennessee State University, you have acknowledged the standards that have been defined in the Student Code of Conduct, and thus you have agreed to adhere to its tenets. Students are responsible for submitting work that reflects their individual performance. Misrepresentation of your own work either through plagiarism, collusion, or data distortion is a serious breach of the code of student conduct. If you have any questions on what constitutes plagiarism, review it in the ETSU Student Handbook.

What you can expect from me:

- Arrive in class on time and prepared (phone off, assigned readings done, ready to participate) and to treat you with respect.
- Make course material relevant by assigning lab exercises that reinforce concepts discussed in class.
- Answer emails in a timely manner (within one business day) and to be in my office when I say I'll be there.
- Work hard to help you learn.

Course Topics

1. Traditional statistics
    a. Exploratory data analysis and descriptive statistics
    b. Comparing two or more groups of data **(Lab 1)**
    c. Exploring the relationship between two variables – Correlation (**Lab 2**)
    d. Using explanatory variable(s) to make predictions - Regression **(Lab 3)**
2. Spatial Statistics
    a. Exploratory spatial data analysis
        i. Types of spatial data
        ii. Descriptive statistics for spatial data **(Lab 4)**
    b. Spatial clustering **(Lab 5)**
        i. Statistics for spatial clustering of point data
        ii. Nearest Neighbor and hot spot analysis
        iii. Kernel Density Estimation
    c. Spatial autocorrelation
        i. Spatial weights
        ii. Global autocorrelation
        iii. Local autocorrelation **(Lab 6)**
    d. Spatial regression
        i. Geographically weighted regression
        ii. Spatial Lag and Spatial Error Models **(Lab 7)**
        iii. Working with rates (Smoothing)
    e. Spatial interpolation **(Lab 8)**
        i. Thiessen polygons
        ii. Inverse Distance Weighting
        iii. Kriging
3. Spatiotemporal modeling **(Lab 9)**

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Course Schedule

Week		Lecture Topic	Assignment (date assigned)
Week 1: Jan 18-22	Monday ETSU closed	Introduction, Data exploration	
Week 2: Jan 25-29		Hypotheses/Comparing groups	Lab 1 Comparing groups
Week 3: Feb 1-5		Correlation	Lab 2 Correlation
Week 4: Feb 8-12		OLS Regression	Lab 3 Regression
Week 5: Feb 15-19		Logistic Regression Spatial Data Intro	**Individual project meetings completed by end of week**
Week 6: Feb 22-26		Spatial descriptive statistics	Lab 4 Spatial descriptive stats
Week 7: Mar 1-5		Point Pattern Analysis Hot Spot Analysis	**Individual project check-ins** Lab 5 Spatial clustering
Week 8: Mar 8-12		Kernel Density Estimation	
Week 9: Mar 15-19	Monday ETSU closed	Spatial Autocorrelation	**Project proposals due** Lab 6 Spatial autocorrelation
Week 10: Mar 22-26		Spatial Regression	Lab 7 Spatial regression
Week 11: Mar 29-Apr 2		Spatial Interpolation	Lab 8 Interpolation
Week 12: Apr 5-9	Wednesday AAG mtg (no class)	Spatial Interpolation cont'd	
Week 13: Apr 12-16	Wed ETSU closed	Space-time analyses	Lab 9 Space-time analysis
Week 14: Apr 19-23		Space-time analyses cont'd Wrap up and Class Summary	
Week 15: Apr 26-30		Student presentations	**Presentations due**
Week 16: May 3-6	Finals Week (**Extended Abstracts due Wednesday May 5 by 11:59 PM**)		

The course schedule, required readings, and procedures described in the syllabus are subject to change. Students will be informed of any such changes via the D2L course site and/or via email.