VMED 5181

Spatial Analysis in Infectious Disease Epidemiology

Spring Semester 2015

Credits:	**3**
Meeting Days:	**Friday**
Meeting Time:	**9:00 – 12:00**
Meeting Place:	**LES 220 (Learning and Environmental Sciences Lab on St. Paul Campus)**
Instructor:	**Dr. Randall Singer**
Office Address:	**300A Vet Sci Building, 1971 Commonwealth Ave., St. Paul, MN**
Office Phone:	**(612) 625-6271**
Fax:	**(612) 625-5203**
E-mail:	**rsinger@umn.edu**
Office Hours:	**By appointment**

I.   Course Description

Knowledge of the spatial distribution of disease events (exposures and outcomes), and factors that determine where disease occurs, is a foundation of epidemiology and public health. Although disease maps have a long history of use in public health, it is only recently that methods for analysis of spatial disease data have become widely available. This course will provide students with a framework for analyzing spatial disease data, and illustrate the importance of such techniques in public health, geography and epidemiology. With this knowledge, students should be able to design, analyze and report on their own studies. The course will focus on human and animal health-related examples. The course will focus primarily on the spatial distribution of infectious diseases, but the principles discussed apply equally well to non-infectious diseases.

II.   Course Prerequisites

None.

III.   Course Goals and Objectives

To understand the ways in which host, agent and environmental interactions influence the transmission of infectious agents, and how the spatial and temporal distributions of risk factors for disease affect these patterns of transmission.

After completing the course, participants will be able to:

- Design a scientific study in which spatial data is integral
- Gain experience in the use of geographic information systems
- Display disease data using a variety of methods
- Be aware of data sources in landscape epidemiology
- Identify disease clustering

- Smooth spatial disease data
- Model spatial disease distributions
- Identify risk factors for the spatial occurrence of disease
- Critically evaluate journal articles concerning spatial epidemiology

<u>Student Learning Outcome (SLO)</u>

- Can identify, define, and solve problems
  - Understand methods for incorporating spatial and temporal data into analyses
  - Develop epidemiological studies that utilize spatial and temporal data
  - Solve real epidemiological problems with spatial analyses

Assignments or coursework related to the SLO:

- All in-class laboratories will help students achieve the SLO goals. The final in-class exam project will demonstrate whether students have synthesized the material in the course.

How is the related coursework assessed?:

- In-class assignments are reviewed and graded by the instructor to determine level of understanding of material. These assignments will help determine if assistance is needed. The final exam project is a graded exam and will demonstrate mastery of the course.

IV. Methods of Instruction and Work Expectations

Presentations will cover basic GIS concepts, an introduction to spatial analysis, GIS in public health, and the inputs required to conceptualize and create a successful GIS project. Participants will be expected to complete assigned readings so they can fully participate.

Computer-based exercises will include preparing data for use in a GIS, joining data to GIS mapping files, basic thematic mapping, geocoding, and spatial analysis. These exercises will be conducted using ArcGIS 10. Participants will be required to complete each assigned exercise.

The course will involve:

- Presentations in epidemiology, medical geography, animal and public health, spatial modeling of disease transmission.
- Classroom discussions of scientific papers and relevant concepts.
- Computer-based exercises which will be used to reinforce the concepts discussed in the lectures.

V. Course Text and Readings

Course Materials: Class notes and review articles will be provided online. Software will be provided by the instructor on the first day of class.

Recommended Text – There is no required text for the course. Strengths and weaknesses of various recommended texts will be discussed on the first day of class.

VI. Course Outline/Weekly Schedule

1	Introduction to course	January 23
	Introduction to ArcGIS	
2	Selections and spatial joins	January 30
3	Selections and spatial joins II	February 6
4	Choropleth mapping	February 13
5	Continuation of mapping	February 20
6	Spatial buffering and zonal statistics	February 27
7	Review of mapping	March 6
8	Midterm Exam (In-Class)	March 13
9	No Class - Spring Break	March 20
10	Descriptive spatial statistics and spatial autocorrelation	March 27
11	Spatial and temporal clustering	April 3
12	Scan statistics	April 10
13	Interpolation techniques, risk factors and risk mapping	April 17
14	GPS and ArcGIS	April 24
15	Review	May 1
16	Final Exam (In-Class portion)	May 8

VII. Evaluation and Grading

Grades will be based on the following:

15%	-	Participation and completion of in-class / take-home exercises
10%	-	Assignment #1 (Due no later than February 20)
10%	-	Article Review #1 (Due no later than March 6)
20%	-	Midterm examination (in-class)
10%	-	Assignment #2 (Due no later than April 17)
10%	-	Article Review #2 (Due no later than May 1)
25%	-	Final examination (take home)

The grading in this course will be non-competitive and grades will be assigned based on mastery of the material. Grades will be based on the standard 90,80,70,60 scale:

A	--	93-100 %
A-	--	90-92 %
B+	--	87-89 %
B	--	83-86%
B-	--	80-82 %
C+	--	77-79 %
C	--	73-77 %
C-	--	70-72 %
D+	--	67-69 %
D	--	63-66 %
D-	--	60-62 %

F   --   0 - 60 % – Represents failure and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I.

S/N option must complete all assignments to a C- level (70%):

S	Achievement that is satisfactory will be expected to complete all assignments and receive a minimum of 70% to receive a passing score (achievement required for an S is at the discretion of the instructor but may be no lower than a 70%).
F	Represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I.

All assignments must be turned in by the assigned date. Each day that an assignment is late will result in a 10% reduction in the overall score for that assignment. Prior arrangements must be made with the instructor if an assignment is expected to be turned in late.

Incomplete Contracts

A grade of incomplete "I" shall be assigned at the discretion of the instructor when, due to extraordinary circumstances (e.g., documented illness or hospitalization, death in family, etc.), the student was prevented from completing the work of the course on time. The assignment of an "I" requires that a contract be initiated and completed by the student before the last official day of class, and signed by both the student and instructor. If an incomplete is deemed appropriate by the instructor, the student in consultation with the instructor, will specify the time and manner in which the student will complete course requirements. Extension for completion of the work will not exceed one year (or earlier if designated by the student's college).

University of Minnesota Uniform Grading and Transcript Policy

A link to the policy can be found at onestop.umn.edu.

VIII.   Other Course Information and Policies

Grade Option Change (if applicable)

For full-semester courses, students may change their grade option, if applicable, through the second week of the semester. Grade option change deadlines for other terms (i.e. summer and half-semester courses) can be found at onestop.umn.edu.

Course Withdrawal

Students should refer to the Refund and Drop/Add Deadlines for the particular term at onestop.umn.edu for information and deadlines for withdrawing from a course. As a courtesy, students should notify their instructor and, if applicable, advisor of their intent to withdraw.

Student Conduct, Scholastic Dishonesty and Sexual Harassment Policies

Students are responsible for knowing the University of Minnesota, Board of Regents' policy on Student Conduct and Sexual Harassment found at www.umn.edu/regents/polindex.html.

Students are responsible for maintaining scholastic honesty in their work at all times. Students engaged in scholastic dishonesty will be penalized, and offenses will be reported.

The University's Student Conduct Code defines scholastic dishonesty as "plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; or altering, forging, or misusing a University academic record; or fabricating or falsifying of data, research procedures, or data analysis."

Plagiarism is an important element of this policy. It is defined as the presentation of another's writing or ideas as your own. Serious, intentional plagiarism will result in a grade of "F" or "N" for the entire course. For more information on this policy and for a helpful discussion of preventing plagiarism, please consult University policies and procedures regarding academic integrity: http://writing.umn.edu/tww/plagiarism/.

Students are urged to be careful that they properly attribute and cite others' work in their own writing. For guidelines for correctly citing sources, go to http://tutorial.lib.umn.edu/ and click on "Citing Sources".

In addition, original work is expected in this course. Unless the instructor has specified otherwise, all assignments, papers, reports, etc. should be the work of the individual student. It is unacceptable to hand in assignments for this course for which you receive credit in another course unless by prior agreement with the instructor. Building on a line of work begun in another course or leading to a thesis, dissertation, or final project is acceptable.

Disability Statement

It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have a documented disability (e.g., physical, learning, psychiatric, vision, hearing, or systemic) that may affect their ability to participate in course activities or to meet course requirements. Students with disabilities are encouraged to contact Disability Services to have a confidential discussion of their individual needs for accommodations. Disability Services is located in Suite180 McNamara Alumni Center, 200 Oak Street. Staff can be reached by calling 612/626-1333 (voice or TTY).

The following policies apply to all courses at the University of Minnesota:

Grading and Transcripts: Twin Cities, Morris, Rochester.
Teaching and Learning: Instructor and Unit Responsibilities: Twin Cities, Morris, Rochester).
Teaching and Learning: Student Responsibilities (Twin Cities, Morris, Rochester)
Makeup Work for Legitimate Absences: Twin Cities, Morris, Rochester
Use of Personal Electronic Devices in the Classroom: Twin Cities, Morris, Rochester
Appropriate Student Use of Class Notes and Course Materials: Twin Cities, Morris, Rochester
Student Conduct Code
Sexual Harassment
Diversity, Equal Employment Opportunity, and Affirmative Action
Availability of Mental Health Services