

# School of Public Health

## Syllabus and Course Information



UNIVERSITY OF MINNESOTA  
Driven to Discover<sup>SM</sup>

### PubH 6100

### GIS and Spatial Analysis for Public Health

### Fall 2018

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<b>Credits:</b>	<b>3 Credits</b>
<b>Meeting Days:</b>	<b>Monday, Wednesday</b>
<b>Meeting Time:</b>	<b>9:05-10:25am</b>
<b>Meeting Place:</b>	<b>Moos Tower 1-430</b>
<b>Instructor:</b>	<b>Jesse D Berman</b>
<b>Office Address:</b>	<b>Mayo Building 420 Delaware Street SE, Room 1228</b>
<b>Office Phone:</b>	<b>612-626-0923</b>
<b>Fax:</b>	<b>612-626-4837</b>
<b>E-mail:</b>	<b>berma186@umn.edu</b>
<b>Office Hours:</b>	<b>Wednesday 11:30-12:30pm or by appointment</b>

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#### I. Course Description

This course is an introduction to Geographic Information Systems (GIS) and its application for public health research. Classwork will be presented in the form of health-related case studies based on research topics pertinent to students in the School of Public Health, where GIS is used to formulate and address scientific hypotheses. Specifically, the ArcGIS software will be presented as a tool for integrating, manipulating, and displaying spatial health data. Topics include understanding spatial data, mapping, topology, spatial manipulations related to data structures, online data, geocoding, remote sensing imagery, and mobile technology. The course will emphasize how to prepare spatial data for a formal statistical analysis, which will be discussed at an introductory level for geostatistical, point pattern, and area-level (or lattice) data examples. Students should leave this course with knowledge to acquire spatial data, visualize geographic trends, and formulate scientific hypothesis for epidemiological applications.

#### II. Course Prerequisites

None. This is an introductory course with no prior knowledge of ArcGIS needed. A basic understanding of public health and biostatistics is preferred.

The use of personal laptops with the ArcGIS software are required for students to follow along during the lab portion and complete assignments. University of Minnesota provides a free time restricted license to all registered students. ArcGIS is a Windows only software, so Mac users will need to follow additional instructions. ArcGIS is available on all computer labs within the University and extra ArcMap resources are available at U-Spatial.

### III. Course Goals and Objectives

Upon completion, students will have the ability to:

- Identify uses for spatial data in public health case studies
- Apply GIS for public health applications in a professional or research setting
- Use maps to manipulate data, formulate scientific hypotheses, and communicate health information
- Identify geographic conditions or locational hazards that affect population risks, including physical agents (i.e. pollutants), environmental agents (i.e. ecologic characteristics), or demographic characteristics (e.g. environmental justice issues)
- Critically evaluate scientific literature that incorporates spatial information and GIS applications
- Prepare a data set for formal statistical analysis

### IV. Methods of Instruction and Work Expectations

Instruction for GIS and Spatial Analysis for Public Health will be a mix of lectures and hands on in-class lab sections working with the ArcGIS software. Lectures will introduce spatial data concepts using public health case studies. We will discuss methods for building a GIS, applications for spatial analysis, and interpretation of spatial data. In-class labs will work through case study examples and teach students methods for spatial analysis using the ArcGIS software. Through case study examples, we will address each of the course goal and objectives.

### V. Course Text and Readings

Course materials, including notes and articles, will be provided through the online website. Instructions on downloading ArcGIS will be provided the week prior to class. Students are urged to download the software as soon as possible. It should be noted that ArcGIS is a Windows only based software. Students with MacOSX or other operating systems will have to download a convertible system (e.g. Parallels, Bootcamp, etc.) to install Windows and ArcGIS.

No text is formally required. An optional text is 'GIS Tutorial for Public Health Fifth Edition' by Kurland and Gorr (ISBN-13: 978-1589483729)

### VI. Course Outline/Weekly Schedule

Week	Date	Topic	Assignments
Week 1	September 5 <sup>th</sup>	Course Overview	
Week 2	September 10 <sup>th</sup>	Introduction to ArcGIS and Spatial Data Types	
	September 12 <sup>th</sup>	Introduction to ArcGIS I	
Week 3	September 17 <sup>th</sup>	Introduction to ArcGIS II/Making a Good Map	
<b>Case Study 1 – Assessment of Air Pollution (Geostatistical Data)</b>			
	September 19 <sup>th</sup>	Introduction to ArcGIS II/Making a Good Map (continued)	
Week 4	September 24 <sup>th</sup>	Case Introduction: Air pollution as a public health issue	Assignment 1 Due
	September 26 <sup>th</sup>	GIS for Air Pollution Data ▪ Projections, spatial overlays	
Week 5	October 1 <sup>st</sup>	GIS for Air Pollution Data ▪ Spatial overlays, joins, buffers	
	October 3 <sup>rd</sup>	GIS for Air Pollution Data ▪ Spatial overlays, joins, buffers, unions	
Week 6	October 8 <sup>th</sup>	GIS for Air Pollution Data ▪ Interpolation techniques	
	October 10 <sup>th</sup>	Air Pollution Case Study Summary	Assignment 2 Due
<b>Case Study 2 – Infectious Disease (Point Pattern Data)</b>			
Week 7	October 15 <sup>th</sup>	Case Introduction: Infectious Disease and Point Pattern Data	
	October 17 <sup>th</sup>	GIS for Point Pattern Data	

Week	Date	Topic	Assignments
		<ul style="list-style-type: none"> <li>▪ Querying</li> </ul>	
Week 8	October 22 <sup>nd</sup>	GIS for Point Pattern Data <ul style="list-style-type: none"> <li>▪ Geocoding</li> </ul>	
	October 24 <sup>th</sup>	GIS for Point Pattern Data <ul style="list-style-type: none"> <li>▪ Hazard mapping; cluster detection; variation in risk</li> </ul>	
Week 9	October 29 <sup>th</sup>	Infectious Disease Case Study Summary	
	October 31 <sup>st</sup>	Google Earth Applications Midterm Exam Review	Assignment 3 Due
Week 10	November 5 <sup>th</sup>	Midterm Exam (in class)	Midterm Exam
<b>Case Study 3 – Environmental Justice (Area Level Data)</b>			
	November 7 <sup>th</sup>	Case Introduction: Environmental Justice and Area Level Data	
Week 11	November 12 <sup>th</sup>	GIS for Area Level Data <ul style="list-style-type: none"> <li>▪ Chloropleth mapping</li> </ul>	
	November 14 <sup>th</sup>	Locating Online Data (U-Spatial)	
Week 12	November 19 <sup>th</sup>	GIS for Area Level Data	
	November 21 <sup>st</sup>	Raster Data and Remote Sensing	
Week 13	November 26 <sup>th</sup>	Area Level Summary	
	November 28 <sup>th</sup>	Developing your Own Spatial Data Project – Part 1 <ul style="list-style-type: none"> <li>▪ Mobile technology</li> </ul>	Assignment 4 Due
Week 14	December 3 <sup>rd</sup>	Developing your Own Spatial Data Project – Part 2 <ul style="list-style-type: none"> <li>▪ Digitizing and Georeferencing</li> </ul>	
	December 5 <sup>th</sup>	Developing your Own Spatial Data Project – Part 3 <ul style="list-style-type: none"> <li>▪ Advanced Spatial Analysis</li> <li>▪ Using R Statistical Software for GIS</li> </ul>	
Week 15	December 10 <sup>th</sup>	Journal Article Review (Brugge et al., 2013; <i>Environmental Health</i> )	
	December 12 <sup>th</sup>	Final Exam (In Class)	Final Exam

## VII. Evaluation and Grading

Students will be evaluated on a series of take home assignments, in-class exams, and regular attendance and participation. The course is offered both for a grade and as a pass/fail option. For take home assignments, students have the option of working alone or in small groups of up to **3 people maximum**. The purpose of this is to engage in collaborative efforts and to learn from your peers; it is not designed to divide up assignments. For students who choose to work in groups, all individuals will be assigned the same grade. When working on assignments, feel free to discuss projects with their classmates, who are often excellent resources.

Assignment #1 (10%) – Due September 24<sup>th</sup>

Assignment #2 (15%) – Due October 10<sup>th</sup>

Assignment #3 (15%) – Due October 31<sup>st</sup>

Midterm Exam (20%) – In class November 5<sup>th</sup>

Assignment #4 (15%) – Due November 28<sup>th</sup>

Final Exam (15%) – In class December 12<sup>th</sup>

Regular attendance and participation (10%)

**Late Assignments:** Assignments must be turned in on time. For each day an assignment is late 10% will be deducted from the project grade and no assignments will be accepted more than 3 days late. Extensions may be requested on a case by case basis, but the Professor must be notified at least 3-days prior to a due date. Within the 3-days window, extensions will not be granted except for emergency situations.

**Make-up Exams:** Students must contact the Professor if a make-up exam is warranted. It will be considered on a case by case basis.

**Attendance Policy:** Students are expected to attend class regularly and be on time. Chronic absences or lateness will be reflected in your grade. If a student must miss extended classes due to illness, emergency, or other reason, you must notify the teacher by email. Absences due to inclement weather will be recognized as 'reasonable absences.'

The University utilizes plus and minus grading on a 4.000 cumulative grade point scale in accordance with the following:

- A 4.000 - Represents achievement that is outstanding relative to the level necessary to meet course requirements - 94-100%
- A- 3.667 - 90-93%
- B+ 3.333 – 87-89%
- B 3.000 - Represents achievement that is significantly above the level necessary to meet course requirements – 83-86%
- B- 2.667 – 80-82%
- C+ 2.333 – 77-79%
- C 2.000 - Represents achievement that meets the course requirements in every respect – 73-77%
- C- 1.667 – 70-72%
- D+ 1.333 – 67-69%
- D 1.000 - Represents achievement that is worthy of credit even though it fails to meet fully the course requirements – 63-66%
- Pass Represents achievement that is satisfactory, which is equivalent to a C- or better.

**For additional information, please refer to:**

<http://policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html>.

### **Course Evaluation**

The SPH will collect student course evaluations electronically using a software system called CoursEval: [www.sph.umn.edu/courseval](http://www.sph.umn.edu/courseval). The system will send email notifications to students when they can access and complete their course evaluations. Students who complete their course evaluations promptly will be able to access their final grades just as soon as the faculty member renders the grade in SPHGrades: [www.sph.umn.edu/grades](http://www.sph.umn.edu/grades). All students will have access to their final grades through OneStop two weeks after the last day of the semester regardless of whether they completed their course evaluation or not. Student feedback on course content and faculty teaching skills are an important means for improving our work. Please take the time to complete a course evaluation for each of the courses for which you are registered.

### **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). For more information and to initiate an incomplete contract, students should go to SPHGrades at: [www.sph.umn.edu/grades](http://www.sph.umn.edu/grades).

### **University of Minnesota Uniform Grading and Transcript Policy**

A link to the policy can be found at [onestop.umn.edu](http://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](http://onestop.umn.edu).

### **Course Withdrawal:**

Students should refer to the Refund and Drop/Add Deadlines for the particular term at [onestop.umn.edu](http://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.

Students wishing to withdraw from a course after the noted final deadline for a particular term must contact the School of Public Health Office of Admissions and Student Resources at [sph-ssc@umn.edu](mailto:sph-ssc@umn.edu) for further information.

### **Class Cancellation:**

In the event of inclement weather or emergency, class may be cancelled at the discretion of the instructor even if the University is still officially open. In the event that class is cancelled, the instructor will notify the student by email at least 2-hours in advance of class time.

### **Student Conduct Code:**

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to Board of Regents Policy: *Student Conduct Code*. To review the Student Conduct Code, please see:

[http://regents.umn.edu/sites/default/files/policies/Student\\_Conduct\\_Code.pdf](http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf).

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities."

### **Use of Personal Electronic Devices in the Classroom:**

Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference:

<http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html>.

### **Scholastic Dishonesty:**

You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means 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; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. (Student Conduct Code:

[http://regents.umn.edu/sites/default/files/policies/Student\\_Conduct\\_Code.pdf](http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf)) If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional

sanctions from the University. For additional information, please see:  
<http://policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html>.

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: <http://www1.umn.edu/oscai/integrity/student/index.html>. If you have additional questions, please clarify with your instructor for the course. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.

**Makeup Work for Legitimate Absences:**

Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see:  
<http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html>.

**Appropriate Student Use of Class Notes and Course Materials:**

Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: <http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html>.

**Sexual Harassment:**

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy:  
<http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf>

**Equity, Diversity, Equal Opportunity, and Affirmative Action:**

The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy:  
[http://regents.umn.edu/sites/default/files/policies/Equity\\_Diversity\\_EO\\_AA.pdf](http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf).

**Disability Accommodations:**

The University of Minnesota is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center Student Services is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DRC at 612-626-1333 or [drc@umn.edu](mailto:drc@umn.edu) to arrange a confidential discussion regarding equitable access and reasonable accommodations.

If you are registered with DS and have a current letter requesting reasonable accommodations, please contact your instructor as early in the semester as possible to discuss how the accommodations will be applied in the course.

For more information, please see the DS website, <https://diversity.umn.edu/disability/>.

**Mental Health and Stress Management:**

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to

assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: <http://www.mentalhealth.umn.edu>.

**The Office of Student Affairs at the University of Minnesota:**

The Office for Student Affairs provides services, programs, and facilities that advance student success, inspire students to make life-long positive contributions to society, promote an inclusive environment, and enrich the University of Minnesota community.

Units within the Office for Student Affairs include, the Aurora Center for Advocacy & Education, Boynton Health Service, Central Career Initiatives (CCE, CDes, CFANS), Leadership Education and Development – Undergraduate Programs (LEAD-UP), the Office for Fraternity and Sorority Life, the Office for Student Conduct and Academic Integrity, the Office for Student Engagement, the Parent Program, Recreational Sports, Student and Community Relations, the Student Conflict Resolution Center, the Student Parent HELP Center, Student Unions & Activities, University Counseling & Consulting Services, and University Student Legal Service.

For more information, please see the Office of Student Affairs at <http://www.osa.umn.edu/index.html>.

**Academic Freedom and Responsibility: *for courses that do not involve students in research:***

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.\*

**OR:**

**Academic Freedom and Responsibility, for courses that involve students in research**

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom and conduct relevant research. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.\* When conducting research, pertinent institutional approvals must be obtained and the research must be consistent with University policies.

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college, (Dr Kristin Anderson, SPH Dean of Student Affairs), or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost.

*\* Language adapted from the American Association of University Professors "Joint Statement on Rights and Freedoms of Students".*

**Student Academic Success Services (SASS): <http://www.sass.umn.edu>:**

Students who wish to improve their academic performance may find assistance from Student Academic Support Services. While tutoring and advising are not offered, SASS provides resources such as individual consultations, workshops, and self-help materials.