



*Meets:* M, W, F 10:50–11:50 a.m.  
Carnegie 107

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*Office hours:* M 3:30–4:00 p.m.  
T 1:15–2:45 p.m.  
Th 10:00–11:00 a.m.  
Th 1:30–2:30 p.m.  
or by appointment

*Teaching Assistants:* Emma Heth, Anjali Mani, Likhwa Ndlovu

## I. COURSE CONTENT AND GOALS

This course focuses on the statistical methods that geographers use to describe and analyze places and themes. You will learn both descriptive and inferential statistical methods for use in geographical research. Applications from all subfields of geography will be used for in-class examples and out-of-class exercises.

This course emphasizes applied statistics. My primary objective is to teach you to use statistics appropriately. Statistics are a valuable tool in geographic analysis, but too often they are used improperly, without a basic understanding of underlying principles and assumptions. You will learn to evaluate and develop statistical research designs, including the preparation and presentation of an original research project of your own.

We will begin the semester with various methods for exploratory data analysis, such as graphical display and the preliminary mapping of spatial information. Topics such as elementary spatial statistics, point-pattern analysis, geographic sampling, and the mapping of residuals from linear regression will also be incorporated into the course. In completing the exercises, you will gain practical experience in the application of statistical methods to spatial problems through the use of statistical software.

By the end of the course, you should be able to think logically and carefully through each step of the research process, from originating the research question to acquiring and evaluating data, operationalizing the question of interest, selecting and using the appropriate statistical tools, analyzing the results, and interpreting the findings.

## II. TEXTBOOK

McGrew, Jr., J. Chapman, Arthur J. Lembo, Jr., and Charles B. Monroe. 2014. *An Introduction to Statistical Problem Solving in Geography*, 3<sup>rd</sup> ed.

Any other required readings will be posted to our Moodle site. Data for the exercises can also be found on our Moodle site. A basic calculator will be needed for completion of the exercises, and during some class periods.

## III. EXPECTATIONS AND GRADING

### Grading

You will be expected to demonstrate a general knowledge of statistical research methods. Class attendance (and participation) is also expected. Your grade will be based on the following:

Exercises and Assignments (12 @ 25 pts. each)	= 40%
Midterm Exam (150 pts.)	= 20%
Final Exam (188 pts.)	= 25%
Final Project and Presentation (112 pts.)	= 15%

The exams will include short answer questions and problem solving, with an emphasis on the appropriate application of the different statistical tests available. You will be evaluated in part on your ability to apply different statistical methods properly and also on your understanding of the rationale for using a given statistical procedure.

Late assignments are penalized 10% per day; *this rule will be enforced!* Assignments must be turned in at the start of class (not later in the day) to be considered on time. No assignment will be accepted once past one week overdue.

Grade cut-off percentages are as follows: A = 93-100%; A- = 90-92.9%; B+ = 87-89.9%; B = 83-86.9%; B- = 80-82.9%; C+ = 77-79.9%; C = 73-76.9%; C- = 70-72.9%; D+ = 67-69.9%; D = 63-66.9%; D- = 60-62.9%; NC = <60%.

### Make-up exams, extensions

Make-up exams are given only for excused absences. In such cases, notify me as soon as possible before the exam. Extensions on assignments or course incompletes will not be granted unless exceptional circumstances require it and prior arrangements have been made.

### **Technology use**

Within the classroom, students are welcome to use laptops for academic purposes; technology use that is disruptive to an academic space is not welcome. When communicating with me via email, I strive to answer messages within 24 hours.

The course syllabus, final project directions, exercises and data, readings, and other information and announcements will be posted to our Moodle site.

### **Academic resources**

The Macalester Academic Excellence (MAX) Center (<http://www.macalester.edu/max/>), located on the first floor of Kagin Commons, provides numerous academic resources from time management and study strategy workshops to quantitative material and writing assistance.

### **Academic accommodations**

In some circumstances, course design may pose barriers to a student's ability to access or demonstrate mastery of course content. Academic accommodations can be implemented in such circumstances. If you think you need an accommodation for a disability, please contact the Disability Services Office (<http://www.macalester.edu/studentaffairs/disabilityservices/>) at your earliest convenience. You may schedule an appointment by emailing [disabilityservices@macalester.edu](mailto:disabilityservices@macalester.edu), or calling the Disability Services Office at 651-696-6974.

### **Academic honesty**

Academic honesty and integrity are expected at all times. You are responsible for knowing what constitutes plagiarism. If you have questions about Macalester's academic integrity policy, please refer to the *Student Handbook* (<http://www.macalester.edu/studentaffairs/studenthandbook/>).

All sources used in preparing your work must be cited; this includes data sources. APA is the preferred citation style of the Geography Department; see the library's citation guides and resources under the Research Guides menu at <https://libguides.macalester.edu/citation>.

### **Individual Health and Well-Being**

Here at Macalester, you are encouraged to make your well-being a priority throughout this semester and your career here. Investing time into taking care of yourself will help you engage more fully in your academic experience. Remember that beyond being a student, you are a human being carrying your own experiences, thoughts, emotions, and identities with you. It is important to acknowledge any stressors you may be facing, which can be mental, emotional, physical, financial, etc., and how they can have an academic impact. In the classroom, eat when you are hungry, drink water, use the restroom, and step out if you are upset and need a break. Please do what is necessary so long as it does not impede your or others' ability to be mentally and emotionally present in the course. Outside of the classroom, sleep, moving your body, and connecting with others can be strategies to help you be resilient at Macalester. If you are having difficulties maintaining your well-being, please reach out to one of the resources listed at <http://bit.ly/2zcyuqU>.

**IV. SCHEDULE AND ASSIGNMENTS***(Please note: schedule subject to revision)*

Date	Topic	Reading/Assignment Due
<b><u>Week 1</u></b>		
1. Fri-Jan 24	Introductions	
<b><u>Week 2</u></b>		
2. Mon-Jan 27	Discussion: The Quantitative Revolution	Golledge et al.; Article of choice (see list on p. 7)
3. Wed-Jan 29	The discipline of geography and quantitative methods	Burt et al. (pp. 8-16) <b>DUE:</b> Discussion summary
4. Fri-Jan 31	Data measurement and classification	Text ch. 1, ch. 2 (sections 2.1-2.3)
<b><u>Week 3</u></b>		
5. Mon-Feb 3	<i>No class – Laura at Valparaiso</i>	
6. Wed-Feb 5	Displaying quantitative information	Text ch. 2 (section 2.4), ch. 3 (pp. 40-41 histogram, ogive)
7. Fri-Feb 7	Data quality and validity	Stack and Gundlach (1992); Stack and Gundlach (1994)
<b><u>Week 4</u></b>		
8. Mon-Feb 10	<i>No class – AAG meeting</i>	
9. Wed-Feb 12	Data sources and acquisition	Saulny; Robertson <b>DUE:</b> Exercise 1
10. Fri-Feb 14	Descriptive statistics	Text ch. 3 (sections 3.1-3.2)
<b><u>Week 5</u></b>		
11. Mon-Feb 17	Descriptive statistics	Text ch. 3 (section 3.3)
12. Wed-Feb 19	Descriptive spatial statistics	Text ch. 3 (section 3.4), ch. 4 (section 4.1)
13. Fri-Feb 21	Descriptive spatial statistics	Text ch. 4 (section 4.2) <b>DUE:</b> Exercise 2
<b><u>Week 6</u></b>		
14. Mon-Feb 24	Probability theory and distributions	Text ch. 5 (section 5.1)
15. Wed-Feb 26	Probability theory and distributions	Text ch. 6 <b>DUE:</b> Exercise 3

<u>Date</u>	<u>Topic</u>	<u>Reading/Assignment Due</u>
16. Fri-Feb 28	Probability theory and distributions	Text ch. 5 (section 5.2) <b>DUE:</b> Project proposal
<b><u>Week 7</u></b>		
17. Mon-Mar 2	Probability theory and distributions	Text ch. 5 (sections 5.3-5.4)
18. Wed-Mar 4	Sampling	Text ch. 7 <b>DUE:</b> Exercise 4
19. Fri-Mar 6	Estimation in sampling	Text ch. 8 (sections 8.1-8.2)
<b><u>Week 8</u></b>		
20. Mon-Mar 9	Estimation in sampling	Text ch. 8 (sections 8.3-8.4)
21. Wed-Mar 11	<b>MIDTERM EXAM</b> (covering chapters 1-7)	
22. Fri-Mar 13	Hypothesis testing (one-sample)	Text ch. 9 (section 9.1)
<i>(Spring Break – March 14-22)</i>		
<b><u>Week 9</u></b>		
23. Mon-Mar 23	Hypothesis testing (one-sample)	Text ch. 9 (sections 9.2-9.3)
24. Wed-Mar 25	Hypothesis testing (two-sample)	Text ch. 10 (section 10.1) <b>DUE:</b> Exercise 5
25. Fri-Mar 27	Hypothesis testing (two-sample);	Text ch. 10 (sections 10.2-10.3)
<b><u>Week 10</u></b>		
26. Mon-Mar 30	ANOVA; Chi-square goodness-of-fit	Text ch. 11 (sections 11.1 and 11.3), ch. 12 (section 12.1) <b>DUE:</b> Exercise 6
27. Wed-Apr 1	Chi-square goodness-of-fit	
28. Fri-Apr 3	Contingency analysis (cross-tabs)	Text ch. 12 (section 12.2), ch. 16 (section 16.1) <b>DUE:</b> Article review
<b><u>Week 11</u></b>		
29. Mon-Apr 6	<i>No class – American Association of Geographers (AAG) conference</i>	
30. Wed-Apr 8	<i>No class – AAG conference</i>	<b>DUE:</b> Exercise 7
31. Fri-Apr 10	Correlation	Text ch. 16 (sections 16.2-16.3); Mauk et al.

Date	Topic	Reading/Assignment Due
<b>Week 12</b>		
32. Mon-Apr 13	Regression	Text ch. 17 <b>DUE:</b> Exercise 8
33. Wed-Apr 15	Regression; Multiple regression	Rosenshein et al.; Text ch. 18 (section 18.1)
34. Fri-Apr 17	Geographically weighted regression; Inferential spatial statistics	Text ch. 13, ch. 14 (section 14.1)
<b>Week 13</b>		
35. Mon-Apr 20	Inferential spatial statistics	Text ch. 15 (section 15.1); Mitchell (pp. 71-79; 104-111) <b>DUE:</b> Exercise 9
36. Wed-Apr 22	Inferential spatial statistics	Text ch. 15 (sections 15.2-15.3)
37. Fri-Apr 24	Finishing up; final project questions	
<b>Week 14</b>		
38. Mon-Apr 27	<b>Final project presentations</b>	<b>DUE:</b> Exercise 10
39. Wed-Apr 29	<b>Final project presentations</b>	
40. Fri-May 1	<b>Final project presentations</b>	
<b>Week 15</b>		
41. Mon-May 4	Final review; course surveys	<b>DUE:</b> Final Project (end of day)
<b>FINAL EXAM:</b> Saturday, May 9 10:30 a.m. – 12:30 p.m.		

**Readings and resources:** (available on Moodle and/or in library)

Burt, James E., Gerald M. Barber, and David L. Rigby. 2009. *Elementary Statistics for Geographers*, 3<sup>rd</sup> ed. New York: The Guilford Press.

Fotheringham, A. Stewart, Chris Brunsdon, and Martin Charlton. 2002. *Geographically Weighted Regression: The Analysis of Spatially Varying Relationships*. West Sussex, England: John Wiley & Sons.

Golledge, Reginald G., et al. 1982. Commentary on 'The Highest Form of the Geographer's Art.' *Annals of the Association of American Geographers* 72(4): 557-9.

Mauk, Gary W., Matthew J. Taylor, Karl R. White, and T. Scott Allen. 1994. Comments on Stack and Gundlach's "The Effect of Country Music on Suicide:" An "Achy Breaky Heart" May Not Kill You. *Social Forces* 72(4): 1249-55.

- Mitchell, Andy. 2005. *The ESRI Guide to GIS Analysis: Spatial Measurements and Statistics*. Redlands, CA: ESRI Press. (Available in GIS lab)
- Nelson, Trisalyn A. 2012. Trends in Spatial Statistics. *The Professional Geographer* 64(1): 83-94.
- Robertson, Campbell. 2011. Smaller New Orleans After Katrina, Census Shows. *New York Times*. February 3.
- Rogerson, Peter A. 2001. *Statistical Methods for Geography*. Thousand Oaks, CA: SAGE Publications.
- Rosenshein, Lauren, Lauren Scott, and Monica Pratt. 2011. Finding a Meaningful Model. *ArcUser*. Winter.
- Saulny, Susan. 2011. Counting by Race Can Throw Off Some Numbers. *New York Times*. February 9.
- Spielman, Seth E. and Alex Singleton. 2015. Studying Neighborhoods Using Uncertain Data from the American Community Survey: A Contextual Approach. *Annals of the Association of American Geographers* 105(5): 1003-1025.
- Stack, Steven and Jim Gundlach. 1994. Country Music and Suicide: A Reply to Maguire and Snipes. *Social Forces* 72(4): 1245-48.
- Stack, Steven and Jim Gundlach. 1992. The Effect of Country Music on Suicide. *Social Forces* 71(1): 211-18.

To choose from for Quantitative Revolution discussion:

- Adams, John S. 2001. The Quantitative Revolution in Urban Geography. *Urban Geography* 22(6): 530-9.
- Barnes, Trevor J. 2008. Geography's Underworld: The Military-Industrial Complex, Mathematical Modelling and the Quantitative Revolution. *Geoforum* 39: 3-16.
- Berry, Brian J. L. 1993. Geography's Quantitative Revolution: Initial Conditions, 1954-1960, a Personal Memoir. *Urban Geography* 14(5): 434-41.
- Getis, Arthur. 1993. Scholarship, Leadership, and Quantitative Methods. *Urban Geography* 14(6): 517-25.
- Hanson, Susan. 1993. 'Never Question the Assumptions' and Other Scenes from the Revolution. *Urban Geography* 14(6): 552-6.
- King, Leslie J. 1993. Spatial Analysis and the Institutionalization of Geography as a Social Science. *Urban Geography* 14(6): 538-51.