GGS 300
Quantitative Methods for Geographical Analysis

General Information
Instructor: Dr. Andreas Züfle
Where: Exploratory Hall 2310
When: Tuesday and Thursday 1:30-2:45pm
Course website: Blackboard
Credits: 3 Credits
Prerequisites: None
Office Hours: Tuesday and Thursday 3-5pm.
Registration Dates: Drop without, with tuition penalties: Jan 30th, Jan 31st – Feb 24th

Required Text
McGrew, Lembo, and Monroe. 2014. An Introduction to Statistical Problem Solving in Geography (Third

Make sure to get the Third Edition! Available at the GMU Bookstore or at www.waveland.com

OVERVIEW & OBJECTIVES
GGS 300 introduces students to the use of statistical techniques and quantitative methods in a spatial
context. The course focuses on the basic components of quantitative research in geography: developing
research questions, evaluating the questions via formal hypothesis testing, and interpreting the results of
the tests (including the redevelopment of research questions). GGS 300 provides students with the ability to:

- Conduct rigorous statistical analysis of data and information commonly encountered in geographic
  research using a widely-used statistical software, and
- Understand statistical analysis that is commonly encountered in geographic research and the
  broader scientific literature.

GGS 300 is a Students as Scholars, Scholarly Inquiry course. In the course, students will learn about the
broader process of conducting research in geography and geoinformation science. Importantly, students will
learn that statistical testing and quantitative approaches are used to not only provide answers, but also to
refine research questions and generate new questions, ideas, and hypotheses. This course will prepare
students to conduct original, scholarly research. In GGS 300, students will learn to:

- Articulate and refine a research question
- Follow ethical principles in research
- Choose the appropriate process, approach, or methodology for scholarly inquiry
- Situate the scholarly inquiry within a broader context

GGS COMPUTER LAB, ASSIGNMENTS, & EXPECTATIONS
GGS 300 Students have 24/7 access to the GGS Student Computer Lab located in 2102 Exploratory Hall. The
computers in this lab have the software required for this course (SPSS). Mason also offers “remote” access to
this software (and others) via the Virtual Computing Lab (http://doit.gmu.edu/students/computer-
labs/virtual-computing-lab/). Lab assignments will be based on the lecture material and will be administered
via Blackboard. Lab assignments will be assigned on Thursdays and will be due the following week prior to
the start of the lecture (except where noted in the Course Schedule). Papers submitted after the due date
will not be accepted. Exceptions to this policy may be made given serious circumstances at the discretion of
the instructor. The course will be taught as a combination of lectures and tutorials.
Outline and Schedule (subject to change)

In this course we will cover the following topics (please note that the topics and their order are subject to change at the discretion of the instructor, any changes will be announced in class):

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Topic</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/24</td>
<td>T</td>
<td>1 - Introduction to GGS 300, Data, and Statistics</td>
<td>McGrew, Chp 1</td>
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<tr>
<td>01/26</td>
<td>R</td>
<td>2 - Characteristics of Geographic Data</td>
<td>McGrew, Chp 2; Steneck, Chp 6 Lab 1: Introduction to SPSS &amp; Data characteristics</td>
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<tr>
<td>01/31</td>
<td>T</td>
<td>3 - Descriptive Statistics</td>
<td>McGrew, Chp 3</td>
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<tr>
<td>02/02</td>
<td>R</td>
<td>4 - Descriptive Spatial Statistics</td>
<td>McGrew, Chp 4; Lab 2: Data Presentation &amp; Description</td>
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<tr>
<td>02/07</td>
<td>T</td>
<td>5 - Basics of Probability</td>
<td>McGrew, Chp 5</td>
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<tr>
<td>02/09</td>
<td>R</td>
<td>6 - Probability</td>
<td>McGrew, Chp 6 Lab 3: Probability Theory</td>
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<tr>
<td>02/14</td>
<td>T</td>
<td>7 - Sampling</td>
<td>McGrew, Chp 7; Steneck, Chp 8; The Ethics of Scientific Collaboration (Discover Blog)</td>
</tr>
<tr>
<td>02/16</td>
<td>R</td>
<td>8 - Sampling (cont.)</td>
<td>Reading Reflection: Scientific Collaboration</td>
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<tr>
<td>02/21</td>
<td>T</td>
<td>9 - Estimation in Sampling</td>
<td>McGrew, Chp 8</td>
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<tr>
<td>02/23</td>
<td>R</td>
<td>10 - Estimation in Sampling (cont.)</td>
<td>Lab 4: Confidence Intervals</td>
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<tr>
<td>02/28</td>
<td>T</td>
<td>11 - Inferential Statistics</td>
<td>McGrew, Chp 9</td>
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<tr>
<td>03/02</td>
<td>R</td>
<td>12 - Inferential Statistics (cont.)</td>
<td>Lab 5: Hypothesis Testing</td>
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<tr>
<td>03/07</td>
<td>T</td>
<td>13 - Two-Sample and Matched-Pairs Difference Tests</td>
<td>McGrew, Chp 10</td>
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<tr>
<td>03/09</td>
<td>R</td>
<td>14 - Two-Sample and Matched-Pairs Difference Tests (cont.)</td>
<td>Midterm Review (due 03/21); Lab 6: Two-Sample Difference of Means Test</td>
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<tr>
<td>03/14</td>
<td>T</td>
<td>Midterm Exam</td>
<td></td>
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<tr>
<td>03/16</td>
<td>R</td>
<td>15 - Three-or-more-Sample Difference Tests</td>
<td>McGrew, Chp 11</td>
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<tr>
<td>03/21</td>
<td>T</td>
<td>16 - Three-or-more-Sample Difference Tests (cont.)</td>
<td>Lab 7: ANOVA (due 03/30)</td>
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<tr>
<td>03/23</td>
<td>R</td>
<td>17 - Categorical Difference Tests</td>
<td>McGrew, Chp 12</td>
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<tr>
<td>03/28</td>
<td>T</td>
<td>18 - Categorical Difference Tests (cont.)</td>
<td>Lab 8: Distribution Test</td>
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<tr>
<td>03/30</td>
<td>R</td>
<td>19 - Introduction to Spatial Analysis</td>
<td>McGrew, Chp 13 and 14</td>
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Grading Schema

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Points</th>
<th>% (of final grade)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Assignments</td>
<td>200</td>
<td>50%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>100</td>
<td>25%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>100</td>
<td>25%</td>
</tr>
</tbody>
</table>

Grades will be based on the following cut of values, although I reserve the right to alter the values at the end of the course: A (93%), A- (90%), B+ (87%), B (83%), B- (80%), C+ (77%), C (73%), C- (70%), D (60%)

Exams
The course includes a mandatory written mid-term and a mandatory written final exam an. The material covered in the exams will be announced in class. A student who cannot write a course examination or complete a course assignment because of an incapacitating illness, severe domestic affliction or other compelling reasons can apply for extension of time to complete an assignment.

Assignments:
The course will include several written assignments on selected topics from the material covered in class and in the assigned reading. Assignments should be done through the Blackboard course website.

Please note: Assignments should be submitted only through the Assignment submission section of the Blackboard system - DO NOT email assignments directly to the instructor.

Late papers submission:
Papers submitted after the due date will not be accepted. Exceptions to this policy may be made given serious circumstances at the discretion of the Instructor.

Please note: Deferral of term work is a privilege and not a right; there is no guarantee that a deferral will be granted. Please make sure you notify the instructor as soon as you know a deferral is required.
General guidelines for ASSIGNMENT preparation and submission

a. Grades of assignments will be based on:

   Academic merit of your answers.

   Conciseness and completeness of your answers. Please write to the point and explicitly address
   the question or task. Avoid using unnecessary graphics (figures, tables, graphs etc.) unless they
   serve a specific purpose. Make sure to use captions and to refer to the graphics you include in
   your written answer. Graphics without any reference or accompanying explanation will be
   disregarded.

   Organization and presentation. Remember that your assignment report is a reflection of your
   thinking and learning process. Please organize your report in a logical fashion so that your
   answers could be easily identified. A general format for your presentation should, as a
   minimum, include the following components: (1) Question number, (2) Your written answer
   and/or description and discussion of your results, and (3) Visualization of your results, e.g.
   images, graphs, tables, as necessary.

b. Please remember that your assignment is a professional document, and should therefore be formatted
   and constructed accordingly. All assignments are to be typed. Hand-written assignments will not be
   accepted.

c. Submission of a hardcopy will be made in class; submission of a softcopy will be made through
   Blackboard.

d. The electronic submission of your assignment report has to be in PDF format.

e. If more than one file is submitted, you may submit a single ZIP file containing all the assignment
   files.

f. Each assignment submission should include a cover page with the following information: assignment
   title, assignment number, student name, and submission date.

  g. Please make sure you have a backup of all the materials you submit.

8. Course website:

   The course has a Blackboard website. This website will provide you a single portal through which you may
   obtain lecture notes, retrieve assignment data and, review links to additional materials, and receive special
   announcements. You are required to visit the course website once per day. Please notify ITU (and, if necessary,
   the instructor) if you encounter any problems accessing this website.

9. Electronic communication:

   All course related email correspondence, including submission of assignments, should be made through the
   course Blackboard website. Please DO NOT send emails to the instructors’ @gmu.edu address.

10. Student Expectations:

   • Academic Integrity: Students must be responsible for their own work, and students and faculty must take
     on the responsibility of dealing explicitly with violations. The tenet must be a foundation of our university
     culture. [See http://academicintegrity.gmu.edu/distance].

   • Honor Code: Students must adhere to the guidelines of the George Mason University Honor Code [See
     http://oai.gmu.edu/the-mason-honor-code/].

   • MasonLive/Email (GMU Email): Students are responsible for the content of university communications
     sent to their George Mason University email account and are required to activate their account and check
     it regularly. All communication from the university, college, school, and program will be sent to students
     solely through their Mason email account.
     [See https://masonlive.login.gmu.edu].

   • Patriot Pass: Once you sign up for your Patriot Pass, your passwords will be synchronized, and you will
     use your Patriot Pass username and password to log in to the following systems: Blackboard, University
     Libraries, MasonLive, myMason, Patriot Web, Virtual Computing Lab, and WEMS. [See
     https://password.gmu.edu/index.jsp].
• **University Policies:** Students must follow the university policies. [See http://universitypolicy.gmu.edu]. Responsible Use of Computing - Students must follow the university policy for Responsible Use of Computing. [See http://universitypolicy.gmu.edu/policies/responsible-use-of-computing].

• **University Calendar:** Details regarding the current Academic Calendar. [See http://registrar.gmu.edu/calendars/index.html].

• **Students with Disabilities:** Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See http://ods.gmu.edu].

• Students are expected to follow courteous Internet etiquette at all times; see http://www.albion.com/netiquette/corerules.html for more information regarding these expectations.

2. **Student Services:**

• **University Libraries:** University Libraries provides resources for distance students. [See http://library.gmu.edu/distance and http://infoguides.gmu.edu/distance_students].

• **Writing Center:** The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing. [See http://writingcenter.gmu.edu]. You can now sign up for an Online Writing Lab (OWL) session just like you sign up for a face-to-face session in the Writing Center, which means YOU set the date and time of the appointment! Learn more about the Online Writing Lab (OWL).

• **Counseling and Psychological Services:** The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance [See http://caps.gmu.edu].

• **Family Educational Rights and Privacy Act (FERPA):** The Family Educational Rights and Privacy Act of 1974 (FERPA), also known as the "Buckley Amendment," is a federal law that gives protection to student educational records and provides students with certain rights. [See http://registrar.gmu.edu/privacy].

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**Disclaimer:** Any typographical errors in this Course Outline are subject to change and will be announced in class. The date of the final examination is set by the Registrar and takes precedence over the final examination date reported by the instructor.

**Note:** Recording is permitted only with the prior written consent of the professor or if recording is part of an approved accommodation plan.