

## GEOG 202 Statistics and Spatial Analysis Fall 2022

(Syllabus subject to modification)

### 1. Course Information

|                | <b>Delivery Mode</b> | <b>Day/Time</b> | <b>Location</b> |
|----------------|----------------------|-----------------|-----------------|
| <b>Lecture</b> | In-person            | W/F 1:05-2:25p  | BH 511          |
| <b>Lab</b>     | In-person            | M 2:35-5:25p    | BH 511          |

\*Details about design and delivery of the course are listed below in Section 6

| <b>Instructor</b> | <b>Contact Information</b>                      | <b>Office Hours</b>                 |
|-------------------|---|-------------------------------------|
| Hongyu Zhang      | Office: BH 308C / 425<br>hongyu.zhang@mcgill.ca | W/F 2:30-3:00p<br>or by appointment |

I will usually respond to e-mails within 48 hours, but this may not always be possible.

Please email from your @mail.mcgill.ca account and use “**GEOG 202** – Email Topic” on the subject line.

| <b>Teaching Assistants</b> | <b>Contact Information</b>    | <b>Office Hours</b>                         |
|----------------------------|-------------------------------|---|
| Yumeng Zhang               | yumeng.zhang@mail.mcgill.ca   | M 2:30-3:30p at BH 511<br>or by appointment |
| Priyanka Verma             | priyanka.verma@mail.mcgill.ca |   |
| Duo Zhang                  | duo.zhang4@mail.mcgill.ca     |   |

### 2. Calendar Description

Geography: Exploratory data analysis, univariate descriptive and inferential statistics, non-parametric statistics, correlation and simple regression. Problems associated with analysing spatial data such as the 'modifiable areal unit problem' and spatial autocorrelation. Statistics measuring spatial pattern in point, line and polygon data.

2.5 hours and lab

You may not be able to receive credit for this course and other statistic courses. Be sure to check the Course Overlap section under Faculty Degree Requirements in the Arts or Science section of the Calendar.

### 3. Textbooks

For lectures:

- Diez, D., Çetinkaya-Rundel, M. and Barr, C.D. (2019). OpenIntro Statistics. 4<sup>th</sup> edition. OpenIntro, Inc. Available online at <https://www.openintro.org/book/os/>
- Rogerson, P. (2015). Statistical Methods for Geography – A student’s guide. 4<sup>th</sup> edition. Sage.

For labs:

- Navarro, D.J. and Foxcroft, D.R. (2022). Learning Statistics with Jamovi. Available online at <https://www.learnstatswithjamovi.com/>
- Anselin, L. (2005). Exploring Spatial Data with GeoDa™: A Workbook. Available online at <https://www.geos.ed.ac.uk/~gisteac/fspat/geodaworkbook.pdf>

#### 4. Course Objectives and Format

This course is intended to introduce you to basic statistical concepts of spatial and non-spatial analysis. The emphasis is on understanding how to select an appropriate descriptive tool or analytical test for different types of data, how to manage particularly spatial problems in statistical analysis, how to conduct basic analyses using statistical software, and how to interpret the output of analyses.

Attendance is not required, but it is strongly encouraged.

Course materials will be posted to myCourses: <http://mycourses2.mcgill.ca>. Any changes will be indicated on the myCourses site and discussed with the class.

#### 5. Learning Outcomes

The course aims to enable you to acquire:

- a knowledge and understanding of basic statistical concepts
- analytical methodological skills, to apply basic spatial and non-spatial analysis
- analytical writing skills, to produce, read and interpret analytical reports
- an introductory understanding of the statistical software packages
- confidence in dealing with numeric and spatial analysis

#### 6. Course Content and schedule

| Weeks | Lecture Dates    | Lecture Topics             | Readings            | Lab Dates | Lab Topics                    |
|-------|------------------|----------------------------|---------------------|-----------|-------------------------------|
| 1     | Aug. 31, Sept. 2 | Introduction to statistics | Diez et al. Ch. 1   | -         | -                             |
| 2     | Sept. 7, 9       | Descriptive statistics     | Diez et al. Ch. 2   | Sept. 5   | No lab                        |
| 3     | Sept. 14, 16     | Probability                | Diez et al. Ch. 3   | Sept. 12  | Lab 1: Descriptive statistics |
| 4     | Sept. 21, 23     | Probability distributions  | Diez et al. Ch. 4   | Sept. 19  | No lab; Lab 1 due             |
| 5     | Sept. 28, 30     | Inferential statistics I   | Diez et al. Ch. 5   | Sept. 26  | Lab 2: Probability            |
| 6     | Oct. 5, 7        | Inferential statistics II  | Diez et al. Ch. 6-7 | Oct. 3    | No lab; Lab 2 due             |
| -     | Oct. 10-12       | Fall reading break         | -                   | Oct. 13   | No lab                        |
| 7     | Oct. 19, 21      | Review & <b>Midterm #1</b> | -                   | Oct. 17   | No lab                        |

|    |                 |                                   |                   |         |  |
|----|-----------------|-----------------------------------|-------------------|---------|--|
| 8  | Oct. 26, 28     | Introduction to linear regression | Diez et al. Ch. 8 | Oct. 24 | Lab 3: Inferential statistics            |
| 9  | Nov. 2, 4       | Multivariate regression           | Diez et al. Ch. 9 | Oct. 31 | No lab; Lab 3 due                        |
| 10 | Nov. 9, 11      | Introduction to spatial analysis  | Rogerson Ch. 10   | Nov. 7  | Lab 4: Regression                        |
| 11 | Nov. 16, 18     | Spatial statistics I              | Rogerson Ch. 10   | Nov. 14 | No lab; Lab 4 due                        |
| 12 | Nov. 23, 25     | Spatial statistics II             | Rogerson Ch. 11   | Nov. 21 | Lab 5: Exploratory spatial data analysis |
| 13 | Nov. 30, Dec. 2 | Synthesis & Review                | -                 | Nov. 28 | No lab; Lab 5 due                        |
| 14 | -               | -                                 | -                 | Dec. 5  | <b>Midterm #2</b>                        |

This course focuses on basic spatial and non-spatial statistical analysis. We will begin the course by covering basic concepts in understanding datasets and probability distributions. The course focuses on helping students to understand the data they are working with, describe the data, select an appropriate statistical test, use common software packages to run that test, understand the output, and interpret results. The second component of the course focuses more specifically on spatial analyses. Students will have the opportunity to learn and apply common spatial statistical techniques and use software packages such as Jamovi and GeoDa for analysis. The statistical concepts and theories introduced in this course are equivalent to standard introductory statistics course credits.

## 7. Evaluation

Below is the evaluation breakdown for the course. Any deviations will be communicated.

| Assessment                   | Format    | Weighting | Due Dates     |
|------------------------------|-----------|-----------|---------------|
| Quizzes (best 10 of 11)      | Online    | 20%       | Weekly        |
| Lab Assignments (x5)         | In-person | 30%       | See Section 6 |
| Midterm Exam #1              | In-person | 20%       | Oct. 21       |
| Midterm Exam #2 (cumulative) | In-person | 30%       | Dec. 5        |

**Quizzes:** (Roughly) each week there will be a quiz to answer online through myCourses in which you apply your knowledge on the content and readings of the last class. They are designed to encourage your regular engagement with the lectures, readings and exercises. They must be completed by the beginning of the next lab (i.e. at 2:30 pm EST on **Monday** before labs).

**Lab Assignments:** The five lab assignments will comprise applied questions of the material discussed in class that you either have to answer manually or with assistance of software. Lab assignments will be due one week after their assignment (i.e. at 2:30 pm EST on **Tuesday** before labs). For all assignments, assessment will be based not only on content, but also on structure, clarity, presentation and organization of material and results.

**Exams:** The Midterm #1 and #2 will assess material covered in both lecture, lab, and textbook. You will be expected to understand and explain statistical concepts, define terms, perform statistical calculations, and interpret statistical software output. The exams will be mixed formats: multiple choice, true/false, fill-in-the-blanks, short answer, definitions, calculations, and diagram questions.

**Make-up quizzes and midterm #1 will not be offered.** Only the best 10 quizzes will be included in the final grade. The weight of missed midterm #1 will be transferred to the midterm #2. Midterm #2 make-up exam will be granted with approved documentation only. The format and content of the make-up will differ substantially from the scheduled midterm exam. For eligibility and requirements, please visit <https://www.mcgill.ca/exams/dates/supdefer>.

**Late penalty:** Late assignments/quizzes have a penalty of 10% per day. A mark of 0% will be recorded if work is submitted more than a week late. Per day is defined each 24-hour period succeeding the allocated assignment deadline – not midnight.

Grades **will not be adjusted** based on need. It is important to monitor your performance in the course. *You* are responsible for your grades in this course. For all grade appeals (except for mathematical errors), wait at least 24 hours after receiving your mark.

The table below outlines the University-wide grade descriptors:

| Grades | Grade Points | Numerical Scale of Grades |
|--------|--------------|---------------------------|
| A      | 4.0          | 85-100%                   |
| A-     | 3.7          | 80-84%                    |
| B+     | 3.3          | 75-79%                    |
| B      | 3.0          | 70-74%                    |
| B-     | 2.7          | 65-69%                    |
| C+     | 2.3          | 60-64%                    |
| C      | 2.0          | 55-59%                    |
| D      | 1.0          | 50-54%                    |
| F      | 0            | 0-49%                     |

## 8. How to Be Successful in This Class

The course is problem-based and applied – you must practice problems and do all exercises to fully understand the material and successfully complete the course. The course material is cumulative. You should review lectures and readings weekly – do not expect success if you only study and practise before exams.

## 9. Academic Integrity

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see <http://www.mcgill.ca/students/srr/honest> for more information). (approved by Senate on 29 January 2003)

L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site [www.mcgill.ca/students/srr/honest/](http://www.mcgill.ca/students/srr/honest/)).

## 10. Language of Evaluation

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded. (approved by Senate on 21 January 2009)

“Conformément à la Charte des droits de l'étudiant de l'Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté (sauf dans le cas des cours dont l'un des objets est la maîtrise d'une langue).”

## 11. More Policies

**Disability:** If you have a disability, please contact the instructor to arrange a time to discuss your situation. It would be helpful if you contact the Office for Students with Disabilities at 398-6009 before you do this.

**Student Rights & Responsibilities:** Policies governing academic issues which affect students can be found in the Handbook on Student Rights and Responsibilities, Charter of Students' Right: <https://www.mcgill.ca/apo/new-tsas-guide/student-life-learning>

**Policy Concerning the Rights of Students with Disabilities:** If you need any accommodation, please contact the Office for Students with Disabilities (<http://www.mcgill.ca/osd> or 514-398-6009). You may also contact me directly. I will make every reasonable effort to accommodate you.

**Copyright of course material:** Instructor generated course materials (e.g. Power Point slides, handouts, notes, summaries, exam questions, etc.) are protected by law and may not be copied or distributed in any form or in any medium without explicit permission of the instructor. Note that infringements of copyright can be subject to follow up by the University under the Code of Student Conduct and Disciplinary Procedures. Recording and distributing recordings of lectures is prohibited unless the instructor gives written consent.

**Course Changes in Extraordinary Circumstances:** In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.

**Indigenous Land Statement:** McGill University is on land which has long served as a site of meeting and exchange amongst Indigenous peoples, including the Haudenosaunee and Anishinabeg nations. We acknowledge and thank the diverse Indigenous people whose footsteps have marked this territory on which peoples of the world now gather.

L'Université McGill est sur un emplacement qui a longtemps servi de lieu de rencontre et d'échange entre les peuples autochtones, y compris les nations Haudenosaunee et Anishinabeg. Nous reconnaissons et remercions les divers peuples autochtones dont les pas ont marqué ce territoire sur lequel les peuples du monde entier se réunissent maintenant.

**Use of calculator:** For midterms which require the use of a calculator, only non-programmable, non-text storing calculators are permitted. Please refer to the Faculty Standard Calculators from the Faculty of Engineering website (<https://www.mcgill.ca/engineering/students/undergraduate/courses-registration/exams-assessment/faculty-standard-calculators>) for a list of recommended models.