# SIM-UB Undergraduate Program
## *GEO 411: Multivariate Analysis in Geography*
## *Spring 2024*

### <u>Course Outline</u>

Instructor:        Justin Holman
Class Day/Time: Wednesdays & Fridays*;* 3:30 - 5:00 p.m.
Classroom:       Please refer to electronic signboard
Office Hours:     Wednesdays & Fridays, 5:00 - 6:30 p.m.
Office Location: Please refer to electronic signboard
E-mail:             [justin.holman@gmail.com](mailto:justin.holman@gmail.com)

**Required course materials:** Statistical Methods for Geography by Peter Rogerson, 4th Ed. In addition, students will read assigned articles, watch assigned documentaries and other videos, attend lectures, and participate in discussions. Students may need a hand-held calculator for homework and exams. You may not use a cell phone, tablet, or laptop calculator for in-class exams.

Many of the exercises will require the use of software for statistical computing. We will use primarily spreadsheet software, Google Sheets and/or Microsoft Excel. Students will also be introduced to the Python programming language.

**Course Description and Objectives:** This is the second course in statistics for those interested in spatial applications. After a brief review, the first section of the course will cover the correlation between two variables and simple linear regression. The primary focus of the course is on multiple regression analysis and modeling techniques. Regression is one of the most widely used techniques in advanced statistics. The end of this course will address Monte Carlo simulation and spatial methods. Examples of analysis in geographic data will be provided throughout the course.

**Course Requirements:**  Students will gain a better understanding of statistics, spatial applications, linear regression and simulation through lectures, discussions, assigned readings, documentaries, and exams. Exams will consist of statistical problem-solving and short essay questions. Attendance at lectures, participation in class discussion, and completion of assignments is expected.

**Student Learning Outcomes:**
By the end of this course, students will be able to perform correlation analysis, simple linear regression and multiple regression modeling. Students will also be able to create and run Monte Carlo simulations. Finally, students should finish the course familiar with various spatial analysis methods.

**Assessments:**
Attendance & Participation (10%)
Midterm Exam 1 (30%)
Midterm Exam 2 (30%)
Final Exam (30%)

**Grading:**

| UB Letter Grade | % Equivalent | Interpretation |
| --- | --- | --- |
| A | 93.0 - 100.0 | High Distinction |
| A- | 90.0 - 92.9 | High Distinction |
| B+ | 87.0 - 89.9 | Superior |
| B | 83.0 - 86.9 | Superior |
| B- | 80.0 - 82.9 | Superior |
| C+ | 77.0 - 79.9 | Average |

| | | |
|---|---|---|
| C | 73.0 - 76.9 | Average |
| C- | 70.0 - 72.9 | Average |
| D+ | 67.0 - 69.9 | Minimal Passing Grade |
| D | 60.0 - 66.9 | Minimal Passing Grade |
| F1 | 0.00 - 59.9 | Failure* |
| F2 | | Failure** |
| F3 | | Failure, no participation |

*participated after the 60% of the session
**started participating but stopped before the 60% point of the session

**Incomplete Grades:** Under certain circumstances (e.g. extended hospitalization), students may apply for a grade of Incomplete. See the UB catalog for details of the Incomplete grade policy and requirements at:

https://catalog.buffalo.edu/policies/explanation.html

Request for an Incomplete grade must be made prior to the end of the semester. Approval is not automatic, must be supported by robust relevant documentation, and is at the discretion of the instructor.

**Classroom Policies:** Professional behavior is expected at all times. Disruptive behavior in the classroom will not be tolerated. Anyone causing a disturbance will be asked to leave.

**General UB Program Policies**
Attendance and active participation is expected by all students in every class. Students are expected to be present for the entire duration of each class. Tardiness to or absenting oneself during class will result in a deduction from the attendance and participation portion of the final grade.

Late assignments, if accepted, will be penalized.

Students who are absent from a **midterm exam** must request a make up exam from the course instructor; a make up will be given only if there is an appropriate, documented reason for absence from the exam (such as an MC); any disputes regarding the validity of the reason or the documentation may be referred to the student advisor.

Students who are absent from a **final exam** must formally request a make up exam in writing to the SIM-UB Assistant Resident Director, within 24 hours of the original exam start time. The make up exam request form can be found in SIMConnect. In all cases, supporting documents must be provided and a make-up exam will only be scheduled if there is a valid and appropriate reason for the absence. For example, prior commitments to external activities or events outside of SIM are not considered a valid reason for absence. For medical cases, students must submit a detailed letter from the doctor**,** highlighting the date of the medical consultation, the nature and the severity of the illness, and how the illness prevented them from taking the scheduled exam, in addition to a Medical Certificate (MC). A **Medical Certificate alone will not be accepted for make-up final exams.** Disputes may be referred to the Resident Director.

There will be no make ups for other course assessments, and students who are absent from such assessments will receive a zero.

**UB Statement of Principle on Academic Integrity:**
The University at Buffalo has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonesty. Students are responsible for the honest completion and representation of their work, for appropriate citation of sources, and for respect for others' academic endeavors. By placing their name on academic work, students certify the originality of all work not otherwise identified by appropriate acknowledgements.

Additionally, students are expected to understand and abide completely by the following guidelines for academic integrity in all UB courses:

Plagiarism, cheating, and other incidents of academic dishonesty will result in an **automatic failing grade for the course.** Depending on the severity of the violation, your case may also be reported to UB for further investigation and may result in expulsion from the university.

Plagiarism consists of copying work from another source without giving proper citations. You must not copy information from printed materials, internet sources, or from the work of other students. If you are uncertain about how to submit your work correctly, consult the instructor immediately.

Any claim of ignorance of the rules of academic integrity by any student is unacceptable.

See the policy here: Undergraduate Academic Integrity Policy

**Reasonable Accommodations and Accessibility Resources for Students with Disabilities**
Reasonable Accommodation refers broadly to reasonable modifications of policies, practices, and procedures as necessary to ensure that persons with disabilities have the same opportunities as others in all programs, services, and benefits of the University at Buffalo. Anyone with a disability who needs reasonable accommodations in the SIM-UB Program should refer to the Student Handbook (available online via SIMConnect) for further information, or consult the Resident Director.

## Syllabus

| Week | Date | Topic |
|------|------|-------|
| 1 | 1/24<br>1/26 | Introduction<br>Scatterplots and Correlation |
| 2 | 1/31<br>2/2 | Linear Regression<br>Linear Regression |
| 3 | 2/7<br>2/9 | Curvilinear Regression<br>*[No class - Chinese New Year]* |
| 4 | 2/14<br>2/16 | Curvilinear Regression<br>Time Series and Forecast Error |
| 5 | 2/21<br>2/23 | Review for Exam 1<br>**Exam 1** |
| 6 | 2/28<br>2/30 | Multiple Regression modeling<br>Multiple Regression modeling |
| 7 | 3/6<br>3/8 | Multiple Regression modeling<br>Multiple Regression modeling |
| 8 | 3/13<br>3/15 | Multiple Regression modeling<br>Multiple Regression modeling |
| 9 | 3/20<br>3/22 | Review for Exam 2<br>**Exam 2** |
| 10 | 3/27<br>3/29 | *[No class - term break]*<br>*[No class - term break]* |

| 11 | 4/3<br>4/5 | Monte Carlo Simulation<br>Monte Carlo Simulation |
|----|------|---------------------------------|
| 12 | 4/10<br>4/12 | *[No class - Hari Raya Puasa]*<br>Monte Carlo Simulation |
| 13 | 4/17<br>4/19 | Monte Carlo Simulation<br>Monte Carlo Simulation |
| 14 | 4/24<br>4/26 | Spatial Methods<br>Spatial Methods |
| 15 | 5/1<br>5/3 | *[No class - Labor Day]*<br>Spatial Methods |
| 15 | TBA | **Final Exam** |

**Disclaimer:** The instructor reserves the right to alter the course schedule and format of the exams asis deemed necessary, with appropriate advanced notice to the students.