

ENVR 4872/GEOG 4872 /GEOG 7872
Advanced Methods in Geomatics
Course Outline

1. General Information

Lecturer: David Walker
(David.Walker@umanitoba.ca)
Office Location: 253 Wallace Bldg.

Lecture Location: WALLACE 218
Lecture Time: 8:30 am - 9:45 am TR
Lab Location: 321 Wallace
Lab Time: 2:30 pm - 5:25 pm T

Objectives: This course focuses on the theory and application of geomatics in spatial problem solving in geography and the environment. The use of geomatics' technologies including GIS, Earth observation and spatial numerical methods will be covered. Students will learn the theoretical underpinning of spatial statistical concepts and will experiment with data exploration, inference and hypothesis testing. Lab assignments will provide practical experience with GIS and other geomatics software as well as CRAN-R.

2. Materials

Required Readings: Papers from leading journals may be assigned as required during the course. Students will need to read the following prior to the first lab:

Dale, M., P. Dixon, M-J. Fortin, P. Legendre, D. Myers and M. Rosenberg. 2002. Conceptual and mathematical relationships among methods for spatial analysis. *Ecography* 25: 558-577.

Required Software: GIS software is a tool for problem solving, while software will be provided in the labs, it is the responsibility of the student to learn these packages. We will use primarily ESRI software (ArcGIS 10) provided

in the lab. If you are not familiar with these packages please take the time to run through their tutorials. That said, a tutorial on installation and use of CRAN-R (libraries: sp, maptools, spdep) will be provided in the lab. General knowledge of spreadsheets, databases and programming would be helpful.

3. Evaluation

Final Paper	40%
Lab Assignment 1	15%
Lab Assignment 2	15%
Lab Assignment 3	15%
Lab Assignment 4	15%

* Assignment due dates will be discussed in class and a mutually agreeable time frame will be established.

4. Format of Lab Assignments

Lab assignments consist of both a written component (expected to be handed-in in digital form) and digital products (e.g. maps). All digital files should be archived in your personal workspace in the computer lab and copied to an electronic drop-box at time of submission (instructions will be given in the first lab). Electronic project submissions will be complete and must open to be considered finished. The written component. Note that all submissions will adhere to a format as prescribed in the assignment hand-out.

5. Format of Final Paper

The final paper should be formatted following the author instructions for a *submitted paper* to a **peer-reviewed journal**. The journal selected should be appropriate for the topic of your final paper but should conform to an experimental science (or social science)-style **full** article. A full article is one that is reporting new findings from a completed study and not a note or brief. For this reason the journal *Science*, and the

journal Nature are not appropriate. Some suggested journals with high impact factors and appropriate article formatting include, Photogrammetric Engineering and Remote Sensing, Remote Sensing of Environment, and Journal of Geographical Sciences, but you are free to choose. Following author instructions means the figures, tables, line numbering, abbreviation and SI Unit conventions, and citations should match the journal instructions. YOU must hand-in a copy of the author instructions with your paper.

6. Grade Distribution Scale

Grade	Range
A+	$\geq 90\%$
A	80 – 89%
B+	75 - 79%
B	70 - 74%
C+	65 – 69%
C	60 – 64 %
D	50 - 59%
F	$\leq 49\%$

7. Academic Regulations

Last VW date: 03/18/2016 for withdrawal without academic penalty. At least two assignments will be graded and returned prior to this date to provide feedback prior to the VW date.

Attendance: Regular attendance is expected of all students enrolled in this course. Please note the following penalty: a student may be debarred from class, laboratories, and examinations by action of the dean/director for persistent non-attendance, or failure to produce assignments to the satisfaction of the instructor. Attendance of all laboratories and completion of **all** laboratory assignments is required to achieve a passing grade. Note that a grade of “F” will be automatically awarded if all assignments are not completed.

Plagiarism: Plagiarism, cheating or impersonation in the completion of assignments, and at examinations, are very serious offences. Students caught plagiarizing on tests and laboratories may be debarred from class with further risk of academic penalty and possible expulsion. All graded work must be independent.

8. Outline of Topics Covered

Please note that this outline is subject to change without notice.

Topic	Description
1	Introduction to Geomatics
2	Geomatics Technologies
3	Multivariate Data and Statistics in Geomatics
4	Spatial Statistical Methods
5	Spatial Autocorrelation and Geostatistics
6	Modeling Point Patterns
7	Spatial Process Modeling in Human and Physical Geography
8	Advanced Modeling and Decision Support in Geomatics
9	Artificial Intelligence and the Future of Geomatics