

COURSE OUTLINE

Fall Term: September 8th – December 7th, 2015

Last Day to Register:	September 21 st , 2015			
Last Day to Withdraw (Refund):	September 21st, 2015			
Last Day to Discontinue (No Refund)	November 8th, 2015			
Last day of in class testing:	November 30th, 2015			
Final Exams:	December 9th-22nd, 2015			
Travel arrangements should not be made prior to the posting of the final Exam Schedule.				

Advanced Quantitative Research Methods (HENV 610)

Course Day/Time: Thursdays 10:15 – 13:00

Course instructor: Zachary Patterson

Telephone: Extension 3492

Room: H1254-2

Office: H1255-15

E-mail: zachary.patterson@concordia.ca

Office Hours: Thursdays 13:00-14:00, or by appointment

COURSE DESCRIPTION

This course will introduce students to the basic concepts of experimental design and data analysis in Geography and Environmental Sciences. The course will focus on statistical analysis of quantitative data, using the R programming environment. Specific topics will include data exploration and plotting, basic statistical tests, linear regression, statistical model selection, non-parametric tests and mixed effects models.

Course Objectives

Over the course of the semester, students will become familiar with the R programming environment at least for the conducting of statistical analysis, and hopefully also for data manipulation and preparation. They will become familiar with the kinds of statistical analysis that are typically used in the fields of geography, planning and environmental studies. They will also work towards understanding the type of statistical analysis that is likely to be done as part of their master's thesis. Ideally, as part of the term project, the student will be able to work with the same dataset they expect to use in the analysis for their thesis. Alternatively, another dataset that resembles the data they expect to use for their thesis will be used.

By the end of the course the student will:

- Be able to input, export, manipulate and visualize data in R.
- Have a grasp of fundamental aspects of statistical analysis (i.e. why do we use statistics?)
- Be able to conduct and interpret parametric and non-parametric statistical tests using R.
- Be able to estimate, interpret and choose the best linear regression, and various other statistical models.
- Have a good idea about the kind of data and statistical analysis they will likely use for their thesis research.

Course Materials

Course lectures will be drawn from a number of different sources. The material from which it is drawn will either be available on the web, in the reading room, or on the course Moodle.

The key sources will be the following:

- Anselin, L. (2003). An Introduction to Spatial Regression Analysis in R. Retrieved from labs.bio.unc.edu/buckley/documents/anselinintrospatregres.pdf
- Anselin, L. (2005). Spatial Regression Analysis in R: A Workbook. Retrieved from https://geodacenter.asu.edu/system/files/rex1.pdf
- Griffiths, W. E., Hill, R. C., & Judge, G. G. (1993). *Learning and practicing econometrics*: Wiley New York.
- Kleinbaum, D. G., & Klein, M. (2005). *Survival analysis: a self-learning text* (Second ed.): Springer.

Kleinbaum, D. G., & Klein, M. (2010). Logistic regression: a self-learning text: Springer.

- Lloyd, C. (2010). *Spatial data analysis: an introduction for GIS users*: Oxford university press.
- Mazerolle, M. (2004). Making Sense out of Akaike's Information Criterion (AIC): its Use and Interpretation in Model Selection and Inference from Ecological Data. Retrieved from theses.ulaval.ca/archimede/fichiers/21842/apa.html.
- Moore, D. S., & McCabe, G. P. (2014). *Introduction to the Practice of Statistics* (Eighth ed.): WH Freeman.
- Train, K. E. (2009). *Discrete choice methods with simulation*: Cambridge university press.
- Transportation Research Board. Preparing papers for peer review and presentation at the TRB annual meeting. Technical report, Transportation Research Board,

Washington, DC, July 2015.

http://onlinepubs.trb.org/onlinepubs/AM/InfoForAuthors.pdf.

Washington, Simon P., Karlaftis, Matthew G. & Mannering, Fred L. Statistical and

econometric methods for transportation data analysis. CRC press, second edition, 2010.

Zuur, A., Ieno, E. N., & Meesters, E. (2009). A Beginner's Guide to R: Springer.

Date **Sources**** for the Lecture Topic Lab* **Evaluation** 10-Sep Introduction Zuur et al. 2009 (Chap 1 - 3 and Х 17-Sep The R Programming Language 6.1 and 6.2) Х Griffiths 1993 (Chap 2-4) Fundamental Stats & Inference 24-Sep Proposal Fundamental Stats, Power & Non-parametric Moore et al. 2014 (Chap 15), 1-Oct Х Assn #1 Newbold 1995 (Chap 9.9) Inference Linear Regression Х Griffiths 1993 (5-12) 8-Oct Moore et al. 2014 (Chap 12-13), 15-Oct **ANOVA & Frequent Modeling Problems** Х TBA Train (Chap 2, 3 & 8) 22-Oct **Discrete Choice Statistics** Х Assn #2 Train (Chap 2, 3 & 8), Discrete Choice & Discrete Dependent Variable Х 29-Oct Kleinbaum & Klein 2010 (Chap Analysis 1,13) Kleinbaum & Klein 2005 (Chap Survival Analysis Х Assn #3 5-Nov 1, 3, 6) Washington et al. 2011 (Chap. 12-Nov Models with Count Data Х 11.1-11.6) Lloyd 2010 (Chap 4.7-4.8), Х 19-Nov Spatial Autoregressive Models Anselin (2003 & 2005) Model Selection and AIC Х Assn #4 Mazerolle 2004 26-Nov 3-Dec **Final Presentations** Х Presentation 10-Dec Final Paper *Labs held from Thursdays 11:30-13:00, H - 1254-2 ** The references used are found in the section "Course Materials"

Course Schedule (subject to changes)

Grading

Students will be evaluated based on the following grading scheme.

Item	% of Mark	
Study Proposal		10
Assignment #1		15
Assignment #2		15
Assignment #3		15
Assignment #4		15
Final Presentation		15
Final Paper		15
Total		100

The study proposal will be a minimum of one page. As described above, the purpose of the paper you will write in this class is *ideally* to get you familiar with the type of data and analysis you are likely to use in your master's research. As such, and after a discussion with your supervisor, the proposal should: describe the type of research (i.e. at least a broad idea) you expect to undertake in your master's research; describe the type of data that is typically used to undertake that kind of research; describe some statistical methods used to undertake the research; describe the data (or type of data) and statistical methods you would like to use in your project. In order to produce this, you will have to do a bit of literature research to read some articles and get a sense of how your area of research interest is undertaken, i.e. the data and statistical methods. This means you will need to include at least 5-15 academic (i.e. not websites) references in your proposal. If you do not know exactly what your topic of research will be for your master's thesis, that is OK. You can also just pick a topic that is of interest to you and choose that for your project.

The final presentation will last around 20 minutes. The presentation will consist of at least the following sections: introduction, background and motivation for the research, the data used, the statistical methods used, model selection, model results, the implications of of your model results (i.e. what you conclude from these results), your study weaknesses and possible improvements, and conclusions. The paper submitted will have the following sections: introduction, literature review, data used, methodology (description of the statistical analysis used), model results, discussion of results and conclusion. It is very important that the literature review provide a survey of literature relevant to your analysis and conclude with a summary of the current state of the literature and how your analysis fits in to the current literature.

The following must be submitted with the final paper: the data used and the R file used to run the analyses presented in the paper. The format of the paper will be done according to the style required when submitting a paper for "Peer review" (see page 14 of Transportation Research Board 2015) to the Annual Meeting of the Transportation Research Board.

The assignments are designed to get you familiar with R as well as with how to use R to undertake various types of quantitative and statistical analysis. Tutorials are designed to help you to do the assignments as well as your final project.

ALL ASSIGNMENTS, THE STUDY PROPOSAL, THE PRESENTATION AND THE FINAL PAPER AND ASSOCIATED FILES WILL BE UPLOADED TO THE MOODLE SITE. THEY WILL NOT BE ACCEPTED IF THEY ARE LATE.

Grading System (Undergraduate calendar 16.3)

At the end of each course, the instructor will submit a letter grade for every student registered. Using the grade point equivalents listed below, grade point averages (GPA) are calculated for the evaluation of academic achievement, honours standing, prizes and academic standing. The numerical marking system, (which at Concordia is at the discretion of individual instructors/programs) applied in this course is as follows:

Dutstanding	Grade	Marks	Grade Points	Very Good	Grade	Marks	Grade Points	atisfactory	Grade	Marks	Grade Points	rginal Pass	Grade	Marks	Grade Points
	A+	90-100	4.30		B+	77-79.9	3.30		C+	67-69.9	2.30		D+	57-59.9	1.30
	А	85-89.9	4.00		В	73-76.9	3.00		C	63-66.9	2.00		D	53-56.9	1.00
•	A-	80-84.9	3.70		B-	70-72.9	2.70	S	C-	60-62.9	1.70	Ма	D-	50-52.9	0.70
F, F	FNS20-49.90Poor - Failure			R		0-19.9	0	Very Poor - Failure							
(NR) 0 Grade Not Reported		GRADING SYSTEM													

Please note that for 200 level courses, instructors in the Department of Geography, Planning and Environment reserve the right to adjust the final reported grades so that under normal circumstances no more than 25% of students registered in a course receive an outstanding grade (A-, A, A+).

Cancellation of Classes (Undergraduate calendar 16.1.5

If no class cancellation notice is posted on the classroom door, classes are officially considered cancelled if an instructor is 15 minutes late for a 50-minute class, 20 minutes late for a 75-minute class, or 30 minutes late for longer classes.

Students should be aware of the following university regulations (see Undergraduate Calendar for complete details).

- Late Completion of Courses with "INC" Notations Procedures and Regulations (Undergraduate Calendar 16.3.6)
- Academic Re-evaluation (Undergraduate Calendar 16.3.9)
- Degree Requirements for BA, BSc, BEd 24 credit rule and general education requirements for students in degree programs offered by Faculty of Arts & Science (Undergraduate Calendar 31.003)

ACADEMIC INTEGRITY:

Academic integrity means that every student must be honest and accurate in their work. The Academic Code of Conduct includes rules and regulations students must follow. Unacceptable practices include the following

- Copy from ANYWHERE without saying from where it came.
- Omit quotation marks for direct quotations.
- Let another student copy your work and then submit it as his/her own.
- Hand in the same assignment in more than one class without permission.
- Have unauthorized material in an exam, such as cheat sheets, or crib notes. YOU DON'T HAVE TO BE CAUGHT USING THEM JUST HAVING THEM WILL GET YOU INTO TROUBLE!

- Copy from someone else's exam.
- Communicate with another student during an exam by talking or using some form of signals.
- Add or remove pages from an examination booklet or take the booklet out of an exam room.
- Get hold of or steal an exam or assignment answers or questions.
- Write a test or exam for someone else or have someone write it for you.
- Hand in false documents such as medical notes, transcript or record.
- Falsify data or research results.

PLAGIARISM: The most common offense under the Academic Code of Conduct is plagiarism, which the Code defines as "the presentation of the work of another person as one's own or without proper acknowledgement."

This could be material copied word for word from books, journals, internet sites, professor's course notes, etc. It could be material that is paraphrased but closely resembles the original source. It could be the work of a fellow student, such as an answer on a quiz, data for a lab report, or a paper or assignment completed by another student. It could be a paper purchased through one of the many available sources. Plagiarism does not refer to words alone. It can also refer to copying images, graphs, tables, and ideas. Plagiarism is not limited to written work. It also applies to oral presentations, computer assignments and artistic works. Finally, if you translate the work of another person into French or English and do not cite the source, this is also plagiarism. In simple words: DO NOT COPY, PARAPHRASE OR TRANSLATE ANYTHING FROM ANYWHERE WITHOUT SAYING FROM WHERE YOU OBTAINED IT!

(Source: The Academic Integrity Website: http://provost.concordia.ca/academicintegrity/plagiarism/)

Take care to inform yourself of the rules, regulations and expectations for academic integrity.

Helpful Websites

Advocacy and Support Services Academic Integrity Website Access Centre for Students with Disabilities (ACSD)	http://www.concordia.ca/offices/advocacy.html/ http://www.concordia.ca/students/academic-integrity.html https://www.concordia.ca/offices/acsd.html
Campus Services	http://www.concordia.ca/students/campus_services.html
Conduct on Campus	http://www.concordia.ca/students/campus-services/conduct.html
Conduct on Campus	http://www.concordia.cd/students/campus-services/conduct.ntm
Counselling and Development	nup://www.concordia.ca/offices/cdev.numi/our-services/services-for-
	<u>new-students/</u>
Financial Aid & Awards	http://www.concordia.ca/offices/faao.html
Health and Wellness	http://www.concordia.ca/students/campus-services/health-wellness-
	fitness.html
International Students' Office	http://www.concordia.ca/offices/iso.html
Library Citation and Style Guides	http://library.concordia.ca/help/howto/citations.html
Safety and Security	http://www.concordia.ca/students/campus-services/safety-
2	emergency.html
Student Success Center	http://www.concordia.ca/students/success.html