Ivey Business School
BUSINESS 9702A: Multivariate analysis
Introduction to Multivariate Mathematical Statistics and Data Analysis
Syllabus Fall 2017

PROFESSOR

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Office Hours: Wednesdays 2-5pm and Friday 3-5pm (sign up sheet outside my office door)

PLACE AND TIME

Date	Tuesday	Thursday
Time	3:00-5:00	**3:30**-5:00
Location	Ivey 2125	Ivey 1140

Couse webpage: Ivey LEARN

Students are expected to attend class, arrive on time, participate substantially in class discussions, behave professionally, and to always exhibit mutual respect.

COURSE OBJECTIVES

This course is an introduction to statistical theory, methods, and applications. The course should serve as a background preparation for many intermediate courses in statistical methods and applications.

COURSE DESCRIPTION

Modern statistical concepts and methods developed in a mathematical framework: statistical inference, point and interval estimation, hypothesis testing, maximum likelihood estimation, large sample theory. This course introduces statistical regression models (ANOVA, linear regression, non-linear regression) with an applied focus. Students will learn the basic concepts behind linear and nonlinear statistical models, and apply them to the analysis of real data sets from various fields. A significant component in the course will be data analysis in R.

COURSE OUTLINE

We will cover the following topics

- Limit theorems and sampling distributions
- Point estimation, confidence intervals, and fitting probability distributions
- Hypothesis testing
- Goodness of fit tests
- ANOVA
- Linear regression models
- Hypothesis testing and parameter estimation in linear models
- Model building and variable selection
- Non-linear models

EVALUATION

Weekly assignments (70%)

There will be **twelve weekly homework assignments**. Unless otherwise specified on the assignment, homework should be completed as an individual effort. Group discussion of assignment questions is permitted, but sharing of complete solutions or software code is not. If you worked with classmates on the assignment, please list their names at the top of your assignment.

All assignments must be completed. Homework assignments are due at **3 pm on Thursdays** (at the beginning of class). Late assignments will not be accepted.

Final project (30%)

The final project will be assigned in mid-November. The project is exclusively an individual effort and must be completed as such. The **final project is due Monday December 18, 2017 at 3pm** but can be submitted earlier.

PRE-REQUISITE KNOWLEDGE

1. Probability at the approximate level of Ross S. A First Course in Probability. Pearson Education.

MATERIALS

Recommended readings for each class will be posted the week before the class on the class website.

Required textbooks:

1. Rice JA. Mathematical Statistics and Data Analysis. 3rd edition. Duxbury Press.
2. Chatterjee, Hadi. Regression Analysis by Example. 4th edition. John Wiley & Sons, Inc.
3. Additional readings or links to readings may be posted by the professor on the course website

Statistical software:

Instruction will be done using the statistical software R (https://www.r-project.org/). The software is free and compatible with Windows, Mac, and Linux/Unix. The software is a standard for users both in and outside of statistics, particularly those that need to do programming of new methods (e.g., from a recent paper in a given area).

1. R. The R Project for Statistical Computing. Available at: http://cran.utstat.utoronto.ca/
   Select: Download R for Windows

2. R Studio. Available at: https://www.rstudio.com/products/rstudio/download/
   Select: RStudio 1.0.153 - Windows Vista/7/8/10

It is expected that all students will be responsible for getting up to speed on the basics of the R package (or whatever statistical package they choose) on their own within the first week or so.

If you prefer to use a different statistical software or programming language/environment, you are free to do so. You will be responsible for seeing that you have sufficient access to software tools and technical assistance for the various topics covered in the course.

ADDITIONAL RESOURCES

R help resources:

1. An Introduction to R. http://cran.r-project.org/doc/manuals/R-intro.html
2. R Software Reference. http://r-dir.com
3. Quick-R. Accessing the power of R. http://www.statmethods.net/
4. Crawley MJ. The R Book. John Wiley and Sons. 2007.
5. Black K. R tutorial. http://www.cyclismo.org/tutorial/R/
6. Each other.

ATTENDANCE

On-time attendance in all sessions is mandatory. If absenteeism has reached 25 percent (i.e., more than 6 classes), your absences will be reported to the Dean's Designate, the PhD Program Director. You may not be eligible to write the final exam or submit the final project.

This UWO policy is outlined at:
http://www.uwo.ca/univsec/pdf/academic_policies/exam/attendance.pdf

See also Western's Policy on Accommodation for Medical Illness at:
www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

In the event of an illness requiring medical documentation, please see the PhD Program office for specific instructions. Note that medical documentation must meet Western's requirements and be submitted to the PhD Program office, not the course instructor. Any non-medical absences from

assignments, reports, and examinations must be approved by the PhD Program office and accommodation for such absences will only be granted under extenuating circumstances.

NOTICE OF ABSENCE
If you are unable to attend class, please email the professor in advance. Submitting assignments on time remains your responsibility.

ACADEMIC DISHONESTY AND PLAGERISM

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf

All required papers may be subject to submission for textual similarity review to the commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

HEALTH AND WELLNESS

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. For example, to support physical activity, all students, as part of their registration, receive membership in Western's Campus Recreation Centre. Numerous cultural events are offered throughout the year. Please check out the Faculty of Music web page http://www.music.uwo.ca, and our own McIntosh Gallery http://www.mcintoshgallery.ca . Information regarding health- and wellness-related services available to students may be found at http://www.health.uwo.ca.

 Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at http://www.health.uwo.ca/mental_health/resources.html.

To help you learn more about mental health, Western has developed an interactive mental health learning module, found here: http://www.health.uwo.ca/mental_health/module.html. This module is 30 minutes in length and provides participants with a basic understanding of mental health issues and of available campus and community resources. Topics include stress, anxiety, depression, suicide and eating disorders. After successful completion of the module, participants receive a certificate confirming their participation.