Course Outline Form: Winter 2016

General Information

Course Title: Applied Multivariate Statistical Methods (STAT*4350/6821)

Course Description: The objective of this course is to acquaint students with the basic ideas, applicability, and methods of multivariate data analysis. We will begin with a brief review of matrix algebra and random vectors. We will then move on to the multivariate normal distribution and making inferences about one or more means. Relevant distributions also include the Hotelling's T distribution and the Wishart distribution. Statistical methods of analysis include MANOVA, MANCOVA, multivariate regression, and dimension reduction methods including principal components, factor analysis and canonical correlation analysis. Other important multivariate techniques are discrimination, classification and clustering methods. Time permitting, or through projects/presentations, we will look at advanced topics such as multivariate adaptive regression splines, projection pursuit regression, graphical Markov models, and dealing with discrete multivariate data.

Credit Weight:

	STAT*4350	STAT*6821
Assignments† (4, equally weighted)	20%	20%
Midterm (Wed. March 5, in-class)	20%	10%
Project	20%	25%
Presentation (graduate students)	–	10%
Final Exam (Friday, April 11, 7-9pm)	40%	35%

Academic Department (or campus): Mathematics & Statistics

Campus: University of Guelph

Semester Offering: Winter 2016

Class Schedule and Location: MWF 12:30 – 1:20pm ROZH 109

Instructor Information

Instructor Name: Ayesha Ali
Instructor Email: aali@uoguelph.ca
Office location and office hours: MACN 509, Wed. 3:30 – 4:30pm (subject to change)

GTA Information

GTA Name: N/A
GTA Email:
GTA office hours and location:

Course Content

Specific Learning Outcomes:

Students who have successfully completed this course will be expected to:

- Have a general knowledge and understanding of many of the key concepts, theoretical approaches and assumptions needed for dealing with multivariate problems;
- Derive some fundamental classical results of multivariate analysis;
- Recognize types of problems (e.g. classification versus clustering) and the appropriate method(s) of analysis;
- Analyze multivariate data using statistical software (e.g. using R and related R packages);
- Develop independent and critical thinking skills with respect to multivariate data;
- Describe statistical methods and analysis results for multivariate data to a non-statistician in a written report with appropriate tables and figures.

Lecture Content: See Course Description.

Labs: N/A

Course Assignments and Tests:

(Due) Date	Assessment	Location	Contribution (4350 / 6821)
Fri., January 22	Assignment 1	In class	5%
Fri., February 5	Assignment 2	In class	5%
Wed., February 24	Project proposal	In class	5%
Wed., March 2	Midterm	In class	5%
Fri., March 11	Assignment 3	In class	5%
Fri., April 1	Assignment 4	In class	5%
April 4 - 8	Presentation	In class	- / 10%
Mon., April 11	Final Project	In class	15% / 20%
Fri., April 22	Final Exam	TBA	40% / 35%

Students are encouraged to discuss assignment questions with each other, but you are expected to complete the assignments yourself and to submit your own work. See below for the University of Guelph policies on Academic Misconduct.

Final examination date and time: Friday, April 22, 2016

Course Resources

Required Texts: None.

Recommended Texts:

Methods of Multivariate Analysis, 3rd Ed., Renchner and Christensen, Wiley, 2012. (online in library)
Applied Multivariate Statistical Analysis, 5th Ed., Johnson and Wichern, Preston Hall, 2002.
Applied Multivariate Statistical Analysis, 3rd Ed., Härdle and Simar, Springer, 2012. (online in library)

Other Resources: Course webpage on Courselink/D2L

Course Policies

Grading Policies: The instructor reserves the right to not accept late assignments, projects or presentations. If you cannot submit such assessments on time, you are advised to notify the instructor as soon as possible to discuss the matter. Late assignments submitted without such notification will be graded with penalty of 10% per day up until day course solutions are posted online or assignments are returned to students, whichever day is earlier. For students who miss the midterm exam due to a valid and documented reason, the weight of the midterm will be shifted to the final exam.

Course Policy on Group Work: N/A

Course Policy regarding use of electronic devices and recording of lectures

Students are permitted to record lectures orally (no video recording). However, such students should first approach the lecturer and provide notification of such intent**.**

Additional Course Information

Project: The project will consist of a written statistical report of a particular application of a multivariate technique to analyse a data set. **You are responsible for proposing your own project topic and finding suitable data.** You will have to submit a project proposal to the instructor approximately one month before the project due date (exact date will be announced later in class).

Usually, a project will require data exploration and a clear understanding of the materials presented in class or any reading assignments. The project is an extremely important tool, not only to help you understand the course subject matter, but also to help you develop a critical view of data analysis. Your report must document the procedures used in your project and relevant findings. **Raw computer output is not acceptable**. Further details for the project will be given out later in the semester.

Presentation: (Graduate students only). The presentation will involve finding a recent article or book chapter that covers an advanced topic in multivariate analysis. You will have to read the article/chapter, understand it, and present it to the class in a twenty to twenty-five minute talk (with possibly more time if the paper requires it). The dates and order of presentations will be determined later on in the semester. BEFORE you start working on the paper, inform the instructor of your choice. The instructor may deem the article not suitable for this presentation and may suggest an alternate article. However, **you are encouraged to select the paper yourself.**

Computing: We will make use of computing since data analysis is a central part of the course material. It is assumed that you already have some experience with the R statistical language, though not necessarily with respect to the topics covered in this course. However, there are several online tutorials available on the CRAN website to help you in this regard (http://cran.r-project.org/). The most recent version of R is also freely available from this site.

University Policies

Academic Accommodation of Religious Obligations

If you are unable to complete a course requirement due to religious obligations, please let the instructor know within the first two weeks of class. See the academic calendar for more information: https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

Academic Consideration

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id#, and e-mail contact. See the academic calendar for information on regulations and procedures for Academic Consideration:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community, faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring.

University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Student Accessibilities Services (SAS) as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.uoguelph.ca/csd/

Course Evaluation Information

Please see http://www.mathstat.uoguelph.ca/files/TeachevaluationformF10.pdf

Drop date

The last date to drop one-semester courses, without academic penalty, is ***Friday*, March 11, 2016**. For regulations and procedures for Dropping Courses, see the Academic Calendar: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml