

**STAT 4690/ 7200 – Applied Multivariate Analysis**  
**WINTER 2016**

<b>CRN</b>	25450/ 25451
<b>Instructor</b>	Dr. Elif F. Acar Machray Hall, room 348 <a href="mailto:elif.acar@umanitoba.ca">elif.acar@umanitoba.ca</a>
<b>Office hours</b>	Tue Th 1:00 PM – 2:00 PM, or by appointment.
<b>Lectures</b>	Tue Th 11:30 AM – 12:45 PM Machray Hall, room 418
<b>Website</b>	<a href="https://umanitoba.ca/d21">https://umanitoba.ca/d21</a>
<b>Textbook</b>	<i>Applied Multivariate Statistical Analysis</i> , 6 <sup>th</sup> edition R. A. Johnson and D. W. Wichern, Prentice Hall, 2007.  The textbook is not required but strongly recommended. A hard-copy will be available on course reserve.

**Prerequisites** Students should have a good working knowledge of statistical inference and linear models: STAT 3480 (005.348) (C); and a C or better in one of MATH 2300 (136.230), MATH 2301, MATH 2352, or the former MATH 2350 (136.235); or consent of instructor. Prior programming experience in R is useful but not required.

**Evaluation** The final grade will be based on the following components.

<b>Assignments</b>	<b>15%</b>
<b>Data Project</b>	<b>15%</b>
<b>Midterm</b>	<b>25%</b>
<b>Final Exam</b>	<b>45%</b>

**Midterm and Final Exams** Exam content is defined by the lecture notes along with the relevant chapters from the textbook. The Midterm Exam is tentatively scheduled to be held during the class time on February 24, 2016. The Final Exam date will be set by the Department of Statistics and announced later in the semester. **There will no make-up exams.**

**Assignments** There will be three assignments (each worth 5%) during the term. Students are encouraged to form study groups to discuss assignment questions but not the answers. Each student must submit his or her own individual written work. Copying, in whole or in part, the work of another will not be tolerated and will result in disciplinary action (see Academic Integrity section). Assignments should be handed in at the beginning of class on the due date. **No late submission will be accepted.**

**Data Project** The data project will be a team project, where students will analyze real data using the techniques covered in the course. Teams will find their multivariate dataset for the project and detail their multivariate analysis in a project report (contributing 10% to final grade) to be submitted in the third last week of the term. Part of the last two weeks' classes will be devoted to group presentations (contributing 5% to final grade), each lasting 10-15 minutes. Further details about the project will be provided in class.

**Requirements for STAT 7200** Students enrolled in STAT 7200 will be required to do additional work in the form of extra assignment and exam questions appropriate at the graduate level.

### **Tentative Topics**

1. Aspects of multivariate analysis: handling multivariate data, graphical displays, statistical distance (Chapter 1)
2. Matrix algebra and random vectors: eigenvalues and eigenvectors, positive definite matrices, mean vectors and covariance matrices (Chapter 2)
3. Random Samples: sample geometry, characterizing random samples (Chapter 3)
4. Multivariate normal distribution: definition and properties, estimation and sampling distributions (Chapter 4)
5. Inferences about a mean vector: Hotelling's  $T^2$  and likelihood ratio tests, confidence regions and multiple comparisons (Chapter 5)
6. Multivariate linear regression: least squares estimation and inference (Chapter 7)
7. Principal Component Analysis: interpretation and use of principal components (Chapter 8)
8. Factor Analysis: orthogonal factor model, estimation and inference (Chapter 9)
9. Canonical Correlation Analysis: canonical variables and canonical correlations (Chapter 10)
10. Discrimination and Classification (Chapter 11) – *if time permits*

### **Academic Integrity**

It is your responsibility to understand the meaning and consequences of academic dishonesty. Therefore, please check:

<http://www.umanitoba.ca/science/undergrad/resources/webdisciplinedocuments.html>.