STAT 505: Applied Multivariate Statistical Analysis
Summer 2016

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Resources: The textbook for this course is *Applied Multivariate Statistical Analysis*, 6e, by Richard A. Johnson and Dean W. Wichern. The required statistical software is SAS, version 9.2 or later. This may be purchased (one year license) for home use through the Penn State Computer Store: https://software.psu.edu/brand/SAS%20License There is also a remote access option through Penn State WebApps: http://webapps.psu.edu/ Help regarding the syntax of SAS commands is available at: www.work.psu.edu/sas/onlinedoc/saspdf/common/mainpdf.htm Most standard statistics procedures for multivariate data analysis can be found under SAS/STAT.

Technical Requirements: For this course we recommend the general World Campus technical requirements: http://www.worldcampus.psu.edu/general-technical-requirements If you need technical assistance at any point during the course, please contact the Outreach Helpdesk: http://student.worldcampus.psu.edu/technical-support

Assessments: Required work will consist of 13 assessments, including 10 homework assignments, two midterm exams, and a final exam. Homework assignments will collectively count as 35% of the course grade, each of the two midterm exams will count as 20%, and the final will count as 25%.

On the homework assignments, you may collaborate with your classmates by posting and answering questions on the discussion boards. However, you must submit your answers individually; copying from each other is not allowed. For all assessments requiring computer analysis, the SAS code should be included but not the raw data. Unless otherwise stated, all assessments are due at 11:59pm (USA Eastern Time) on the Monday following the week they were assigned. There will be a 24-hour grace period subject to a 10% penalty. Any conflicts should be discussed in advance.

All exams will be open-book, and no proctoring will be necessary. However, in addition to the weekly deadline of Monday, 11:59pm, EST, there will be a 2-hour time window for midterms and a 3-hour time window for the final. This time is imposed from the moment you first access the exam until the time of your submission. These times are recorded automatically through ANGEL, so please be aware of this. Note especially that this time window includes time spent downloading, uploading, etc., so please allow time for these actions. Submissions after the allowed time period will not be accepted.

For all assessments, homework and exams, if multiple submissions are made, only the most recent one will be graded, provided it is not late. Earlier submissions will be deleted.

Grading: Semester grades are assigned according to this scale. See the posted "Schedule" file for due dates and textbook readings.

93 – 99%	A	77 – 79%	C+
90 – 92%	A-	70 – 76%	C
87 – 89%	B+	60 – 69%	D
83 – 86%	B	0 – 59%	F
80 – 82%	B-		

Academic Integrity: All Penn State and Eberly College of Science policies regarding academic integrity apply to this course. See http://science.psu.edu/current-students/Integrity/Policy.html for details. Please understand that the integrity policy also applies to the use of clickers.

Code of Mutual Respect: The Eberly College of Science Code of Mutual Respect and Cooperation (http://science.psu.edu/climate/code-of-mutual-respect-and-cooperation/Code-of-Mutual-Respect%20final.pdf/view embodies the values that we hope our faculty, staff, and students possess and will endorse to make the Eberly College of Science a place where every individual feels respected and valued, as well as challenged and rewarded.

Disabilities statement: Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services (ODS) at 814-863-1807 (V/TTY). For further information regarding ODS, please visit the Office for Disability Services web site athttp://equity.psu.edu/ods/.

Campus emergencies: Campus emergencies, including weather delays, are announced on Penn State Live (http://news.psu.edu/) and communicated to cellphones, email, the Penn State Facebook page, and Twitter via PSUTXT (to sign up, please see http://psutxt.psu.edu).

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. **Learning Objectives**

1) Interpret graphical methods for summarizing multivariate data including histograms and scatterplots.

2) Understand when transformations of the data should be applied and what specific transformations should be considered.

3) Learn how to identify unusual observations (outliers), and understand issues regarding how outliers should be handled if they are detected.

4) Interpret measures of central tendency, dispersion, and association.

5) Construct and interpret confidence interval for a single multivariate normal population mean and for several multivariate normal population means simultaneously.

6) Conduct and interpret a test of population parameters for a multivariate population.

7) Interpret a conditional distribution and partial correlations.

8) Carry out and interpret the following analyses using software:

    i) Principal components analysis
    ii) Canonical correlation analysis
    iii) Factor analysis
    iv) Discriminant analysis
    v) Hotelling's T-square test
    vi) Multivariate analysis of variance (MANOVA)
    vii) Cluster analysis

9) Compute and interpret simultaneous and Bonferroni confidence intervals.

10) Recognize when treatments are applied over time and to test for interactions between treatments and time, and the main effects for treatments and time.