Statistics 5353 (Methods of Multivariate Analysis**)**
Time: MWF 8:35 AM – 9:25 AM (Room: SCEN 0322)

Instructor: Dr. Avishek Chakraborty (email: **ac032@uark.edu)**

Office hours: Wednesday 2:15 PM–4:00 PM in SCEN 315 and other times by appointment. These times are subject to change.

Prerequisites: The course lectures will assume students have a background in Statistics, Probability distributions and Matrix algebra. For statistics and probability, the students are required to know the concepts and methods at the level of STAT 5313. Many of the founding concepts will be directly borrowed from that class. Another very important requirement is prior experience with matrix algebra. Almost every lecture of this course will use matrix notations and topics that depend on knowledge of inverse, determinant, eigenvalues and eigenvectors, rank, quadratic forms, partitioned matrices. I shall assume the students are familiar with these concepts. For those students who are looking for a course to increase their familiarity with matrix-based methods, I strongly recommend attending MATH 4353 Numerical Linear Algebra.

Syllabus: (broadly**)** Multivariate normal distribution, Principal component analysis, Factor analysis, Linear discriminant Analysis, Tree-based methods, Support Vector Machines, Cluster Analysis, Nonlinear Dimensionality Reduction. This is only a *tentative* list. I may exclude/alter the length and time spent on any particular topic or add any new topic to accommodate this particular class of students.

Grades: The grading system will follow the weights and cutoffs mentioned in the following table. **No additional grading opportunity will be provided to any student** under any circumstances.

30% Homework	A	90.00 - 100%
15% R Assignments	B	80.00 – 89.99%
25% Only Midterm (In-Class)	C	70.00 – 79.99%
30% Final Exam(In-Class)	D	60.00 – 69.99%
	F	0 – 59.99%

Homework:

- Unless otherwise specified, homework will be posted on Friday and will be due by Wednesday end of work hours of the following week**.**
- I will drop your lowest homework grade**.**

R Assignments:

- There will be 3 programming assignments during the semester which will involve data analysis in R
- I will drop your lowest R assignment grade**.**

Only Midterm and Final Exam:

- Midterm and Final Exam will be in-class.
- The date of Midterm will be announced at least 2 weeks before the exam.
- Final exam will be cumulative unless I specifically exclude any topic before the final.

The students are encouraged to discuss among themselves about course materials and concepts but the homework, R assignments and exam solutions must be your own work.

Study Plan:

- I shall discuss the key concepts, methods and provide examples in the class. It is important to be present in the class, take notes and go through them after the class.

- The focus of this course is to introduce theory and methods in Multivariate Statistics in a rigorous way. Your class lectures, homework and in-class exams will require you to work on proofs, conceptual problems as well as small computations. Hence, to do well in this course, you need to be comfortable with theoretical details and computational aspects.

- You will learn to implement some of the methods in R. Implementing some of the advanced methods will be covered in more details in STAT 5443 (Computational Statistics) in Spring.

Textbook: I am going to borrow some of the materials broadly from the book **Modern Multivariate Statistical Techniques: Regression, Classification and Manifold Learning** by A. J. Izenman, Springer. This book may not include all the topics that I plan to teach. You are Not required to have this book. For my lectures, I am not going to assume you have this book and shall develop everything on its own. I may post lecture notes on some of the covered topics. To prepare for the class, you should use the book only in addition to my lecture notes. It is the student's responsibility to take notes of class discussion. If you cannot attend a lecture, please make sure to take the class notes from other students.

Attendance: Examples of absences that should be considered excusable include those resulting from the following: 1) illness of the student, 2) serious illness or death of a member of the student's immediate family or other family crisis, 3) University-sponsored activities for which the student's attendance is required by virtue of scholarship or leadership/participation responsibilities, 4) religious observances (see UA Religious Observances policy below), 5) jury duty or subpoena for court appearance, and 6) military duty. You are responsible to collect the course material that has been covered during your period of absence. If you miss any exam or quiz due to an excused absence, you are required to contact the instructor within 24 hours of joining the class to reschedule it.

ACADEMIC INTEGRITY: "As a core part of its mission, the University of Arkansas provides students with the opportunity to further their educational goals through programs of study and research in an environment that promotes freedom of inquiry and academic responsibility. Accomplishing this mission is only possible when intellectual honesty and individual integrity prevail." Each University of Arkansas student is required to be familiar with and abide by the University's Academic Integrity Policy which may be found at http://provost.uark.edu/. Students with questions about how these policies apply to a particular course or assignment should immediately contact their instructor.

ACCOMMODATIONS: Under University policy and federal and state law, students with documented disabilities are entitled to reasonable accommodations to ensure the student has an equal opportunity to perform in class. If you have such a disability and need special academic accommodations, please report to Center for Educational Access (CEA). Reasonable accommodations may be arranged after CEA has verified your disability.

INCLEMENT WEATHER POLICY: The instructor will make every effort to hold class whenever the University is open. If you feel that travel is too hazardous due to weather conditions, inform your instructor by email. Students will not be penalized for being absent on days the Fayetteville Public Schools are closed due to weather. However, as with any absence, all are responsible for any missed material. If the university is officially closed, class is canceled.