

Course Title:	Multivariate Analysis
Course Code:	STAT-305
Semester:	VI
Credit Hours:	3 Credit Hours
Pre-requisites:	STAT-101, STAT-102

Learning Outcomes

By the end of this course, students will be able to:

1. Learn the objectives and applications of Multivariate techniques.
2. Know the underlying theoretical framework of Multivariate techniques (multivariate normal distribution).
3. Acquire the knowledge of Wishart distribution.

Course Outline

Unit 1

1.1 Review of matrix algebra

Refreshing fundamental concepts in matrix algebra: matrices, vectors, operations (addition, subtraction, multiplication), and properties

1.2 Multivariate Distributions

Notions of multivariate distributions. The multivariate normal distribution and its properties. Linear compound and linear combinations. Estimation of the mean vector and the covariance matrix.

1.3 Wishart Distribution

Wishart distribution and its properties. The joint distribution of the sample mean vector and the sample covariance matrix. Hotelling's t^2 distribution.

1.4 Conditional Distribution of M.V normal

Mean and variance of conditional distribution, inferences for multivariate means, confidence regions for multivariate means.

1.5 Factor Analysis

Exploratory factor analysis, model specification, and identification. Confirmatory factor analysis.

1.6 Canonical Correlation Analysis

Concept of canonical variables, estimation and interpretation.

1.7 Discriminant Analysis

Linear discriminant analysis and quadratic discriminant analysis

1.8 Principal Component Analysis

The concept and objectives of PCA, Eigenvalues and Eigenvectors. Application of PCA.

- **Teaching-learning Strategies:**

Class Lecture method, which includes seminars, discussions, assignments and projects. (Audio-visual tools are used where necessary)

- **Assignments-Types and Number with calendar:**

According to the choice of respective teacher.

- **Assessment and Examinations:**

According to the University's Semester Rules.

Sr. No.	Elements	Weightage	Details
1	Midterm Assessment	35%	It takes place at the mid-point of the semester.
2	Formative Assessment	25%	It is continuous assessment. It includes: Classroom participation, attendance, assignments, and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

Text Book

1. Johnson, R.A., & Wichern, D.W. (2008). *Applied multivariate statistical analysis*. Pearson Education: Singapore.

Suggested Readings

1. Anderson, T.W. (2003). *An introduction to multivariate statistical analysis* (3rd ed.). John Wiley & Sons: New York.
2. Chatfield, C., & Collins, A.J. (1981). *Introduction to multivariate analysis*. Chapman and Hall: London.
3. Morrison, D.F. (2004). *Multivariate statistical methods* (4th ed.). McGraw Hill Publishing Co, New York.