Institute of Administrative Sciences
Faculty of Business, Economics, and Administrative Sciences
University of the Punjab, Lahore
Course Outline

Programme	BS Management	Course Code		Credit Hours	3

Course Title	Multivariate Analysis

Course Introduction

The course is basically aimed at introducing students to Classical multivariate statistics theory: Basic properties of random vectors; Multivariate normal distributions; Elliptical and skew-elliptical distributions; Estimation; Hypothesis testing. Methods of multivariate statistical analysis: Principal component analysis; factor analysis; canonical correlation analysis; A review of standard analysis of variance (ANOVA), ANCOVA (analysis of covariance), MANOVA (Multivariate ANOVA) and MANCOVA (Multivariate ANCOVA); discriminant analysis; cluster analysis; multidimensional scaling; multivariate regression; support vector machines; independent component analysis.

Learning Outcomes

On a general level the students should be able to understand the concept of analyzing multivariate data. They should be familiar with a regression model, correlation, causation and structural equation models. On successful completion of the course the student:

- will be able to summarize and interpret multivariate data,
- will be able to analyze data in statistical software packages.
- will understand the link between multivariate techniques and corresponding
- univariate techniques,
- will be able to use multivariate techniques appropriately, undertake multivariate hypothesis tests, and draw appropriate conclusions.

Course Content		Assignments/Readings
Week 1	Unit 1: Preparation for Analysis	
Week 2	Unit 2: Characterizing data for analysis	
Week 3	Unit 3: Preparing for data analysis	
Week 4	Unit 4: Data visualization, Data screening and transformations	
Week 5	Unit 5: Selecting appropriate analyses	
Week 6	Unit 6: Simple regression and correlation	
Week 7	Unit 7: Multiple Regression Analysis	
Week 8	Unit 8: Multiple Discriminant analysis	
Week 9	Unit 9: MANOVA: Extending ANOVA	
Week 10	Unit 10: Logistic Regression: Regression with a Binary Dependent Variable	

Week 11	Unit 11: Exploratory Factor Analysis	
Week 12	Unit 12: Structural Equation Modeling: An Introduction	
Week 13	Unit 13: Confirmatory Factor Analysis and Structural Equation	
Week 14	Unit 14: Cluster analysis	
Week 15	Unit 15: Log-linear analysis	
Week 16	Unit 16: Partial Least Squares Structural Equation Modeling (PLS-SEM)	

Textbooks and Reading Material

- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). Multivariate Data Analysis.
- Cengage Learning.
- Afifi, A. A., May, S., Donatello, R. A., & Clark, V. (2021). Practical multivariate analysis. CRC
- Press.
- Vehkalahti, K., & Everitt, B. (2020). Multivariate Analysis for the behavioral sciences. CRC
- Press.
- Pallant, J. (2016). SPSS Survival Manual (Vol. 4 uppl). Maidenhead: McGraw-Hill.
- Fourth Edition
- Saldaña, J. (2015). The coding manual for qualitative researchers. Sage.
- Statistical Techniques in Business and Economics, Lind Marshal Mason, Eleventh Edition.
- Multivariatr Data Analysis, Joseph F. Hair, Jr. William C. Black Barry J. Babin Ralph E. Anderson, seventh edition.
- Structural Equation Modelling with AMOS, Barbara M. Byrne, Second Edition

Teaching Learning Strategies

This course makes use of interactive teaching and learning strategies which engage students to promote critical and reflective thinking, research and evaluation skills that will help them become better learners and enhance their skill set. Students will use personal and social capability to collaboratively work with others in learning activities, appreciate their own strengths and abilities and those of their peers, enabling them to develop a range of interpersonal skills such as communication, negotiation, teamwork, leadership and an appreciation of diverse perspectives.

Assignments: Types and Number with Calendar

Will be decided by the course instructor

Assessment

Sr. No.	Elements	Weightage	Details
4.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
5.	Formative Assessment	25%	Continuous assessment includes Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.

6.	Final Assessment	40%	Written Examination 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.