BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
HYDERABAD CAMPUS
FIRST SEMESTER 2021-2022
COURSE HANDOUT (Part II)

Date: 20/08/2021

In addition to Part I (General Handout for all courses appended to the time table) portion:

Course Number : **MATH F432**
Course Title : **Applied Statistical Methods**
Instructor-In charge : **Sayan Ghosh**
Instructor : **Sayan Ghosh**

1. **Scope and objective of the course:**
   This course helps students in two ways mainly. Firstly, it helps them in understanding various statistical methods along with the corresponding theory and its hands on applications. More precisely, the course gives an exposure to different multivariate techniques. Secondly, it improves their methodological maturity.

2. **Text Books:**
   David R Anderson, Dennis J Sweeney, Thomas A Williams, Jeffrey D. Camm and James J. Cochran, Statistics for Business and Economics, 12th Edition, Cengage Learning, 2014

3. **Reference Books:**
   1. Deepak Chawla and Neena Sondhi, Research Methodology, Vikas, 2012
   2. Applied Multivariate Statistical Analysis by Richard Johnson and Dean W Wichern, Pearson, 2007
   3. Douglas C. Montgomery, "Statistical Quality Control", Wiley Student Education.
   4. Applied Multivariate Techniques by Subhash Sharma, John Wiley & Sons, Inc.
   5. Multivariate Statistical Methods by Donald F. Morrison, 4th Edition, TMH, 2005.

4. **Lecture Plan:**

Lecture	Learning Objectives	Topics to be covered	Chapter in the Text Book
1-2	It helps students to recapitulate the basic probability concepts.	Revision of basic probability concepts, Random variables, Probability distributions, Moments.	4-6 (T1)
3-4	It enhances the understanding of different sampling procedures, sampling distribution and inferential procedures.	Introduction, Review of Sampling, Selecting a Sample, Sampling from a finite and infinite population, Point Estimation, Sampling distribution of sample mean and Properties of Point Estimators, Other sampling methods.	7,7.2,7.3,7.4,7.5,7.7,7.8 (T1)

5-6	It helps in understanding the concepts of hypotheses, and various errors followed by decision scenarios.	Interval estimation, Population mean when variance is known or unknown, Determining the sample size. Introduction to hypothesis testing, Types of errors, Inferences about single population mean.	8,8.1,8.2,8.3 (T1) 9,9.1,9.2,9.3 (T1)
7-8	To gain knowledge about the importance of variance, chi-square distributions and its types.	Inferences about Difference of Paired Means, Inferences about Population Variances, Interval estimation.	10,10.1,10.2,10.3,11,11.1.11.2 (T1)
9-11	It helps us to gain knowledge to obtain accurate and replicable findings at reasonable allocations of resources. We review some general principles and types of designs.	Testing the equality of population proportions, Test of Independence, Goodness of fit test. An introduction to Experimental Design and Analysis of Variance (Completely randomized design, Multiple comparison Procedures, Randomized Block Design).	12,12.1,12.2,12.3 (T1) 13,13.1,13.2,13.3,13.4 (T1)
12-14	To gain knowledge about a basic regression model.	Simple Linear Regression Model, Least Squares Method, Coefficient of Determination, Model Assumptions, Test for significance, Using the estimated regression equation for estimation and prediction, Residual analysis: Validating model assumptions, outliers and influential observations. Discuss case Studies.	14,14.1,14.2,14.3,14.4,14.5,14.6,14.8.14.9 (T1)
15-17	It helps in understanding more than two variables in regression analysis and also gives insight into the concept of multicollinearity.	Multiple Linear Regression Model, Least Squares Method, Multiple coefficient of determination, Model Assumptions, Testing for significance, Multicollinearity. Regression equation for estimation and prediction, Residual Analysis. Discuss Case Studies.	15,15.1,15.2,15.3,15.4,15.5,15.6,15.8 (T1)
18-20	It gives an exposure to distinguish between Categorical Independent and Categorical Dependent variables, Regression Analysis.	Categorical Independent Variable, Logistic Regression. Discuss Case Studies.	15.7,15.9 (T1)

21-23	It helps in assessing the classification accuracy of a model.	Hotelling T^2 and Mahalanobis D^2 Discriminant Analysis, Objectives and its Uses, Illustration of Discriminant Analysis, Assessing Classification Accuracy. Discuss Case Studies.	11(R2),17 (R1)
24-27	It helps in understanding hierarchical, non-hierarchical cluster analysis.	Cluster Analysis - a classification technique, Statistics associated with Cluster Analysis, An illustration of the technique, Key Concepts in Cluster Analysis, Process of Clustering, Establishing Cluster Algorithms. Discuss case studies.	12(R2),18 (R1)
28-31	It helps in understanding data reduction methods.	Factor Analysis and its Uses, Conditions for a Factor Analysis, Illustration of Factor analysis, Applications of Factor Analysis in other Multivariate Technique. Discuss Case Studies.	9 (R2),16 (R1)
32-35	It gives a basic idea about forecasting methods.	Forecasting, Components of a Time series, Smoothing Methods, Trend Projections, Trend and Seasonal Components, Regression Analysis, Qualitative approaches.	17.1-17.6 (T1)
36-37	It helps in understanding distribution free methods in parallel to parametric procedures.	Kruskal Wallis test, Mann Whitney Wilcoxon Test, KS two sample test.	18.1-18.4 (T1)
38-40	Statistical Quality Control	Introduction, Control Charts for variables, Control Charts attributes, Modified Control Charts.	19.1,19.2 (T1)

5. Evaluation Scheme:

Evaluation Component	Duration	Weightage	Date & Time	Nature of Component
Two Quizzes	45 Min	30%	Will be announced in class.	Open Book
Mid Semester	90 Min	30%	21.10.2021, 3:30 p.m. - 5:00 p.m.	Open Book
Comprehensive Exam	120 Min	40%	21.12.2021, FN	Open Book

Note: Total marks with all the evaluation components taken together will be 200.
6. Chamber Consultation hours: To be announced in class.
7. Notices: All notices in relation to the above course will be put up on CMS.
8. Make up policy: Make up will be granted only in genuine cases. Permission must be taken in advance except in extreme cases.
9. Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor in charge