BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
Pilani Campus
AUGS/ AGSR Division

FIRST SEMESTER 2019-2020
COURSE HANDOUT (Part II)

Date: 22.07.2019

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 : **Dr. Sumanta Pasari**
Instructor   : **Dr. Sumanta Pasari**

1. **Course Description:**
   Applied Statistics is an exciting sub-area of Statistics. It has application in almost all science disciplines which deal with data and uncertainty. This course builds up fundamental concepts of various key statistical methods necessary to analyze/interpret a variety of practical business/engineering problems. This course emphasizes the role of statistics in one's own field of study by making sense of data, developing self-ability to apply appropriate statistical methods, performing experimental designs and above all, realizing the limitations/inherent assumptions in a statistical test to avoid over interpretation or misinterpretation. The thrust areas covered in this course include probability distributions, statistical inference, analysis of variance (ANOVA), regression and correlation, discriminant analysis, factor and cluster analysis, time series analysis and forecasting, nonparametric methods and statistical quality control. The theoretical learning will be complemented with various case studies and hands-on training in excel.

2. **Scope and objective of the course:**
   This 4th level course is designed with a two-fold purpose. First, it will provide an exposure to various theoretical univariate/multivariate methods and their practical applications. Second, this course will improve methodological/analytical maturity to attempt a variety of problems using MS-excel toolbox.

3. **Text Book:**
   T1: 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

4. **Reference Books:**
   1. Deepak Chawla and Neena Sondhi, Research Methodology, Vikas, 2012
   2. Richard Johnson and Dean W Wichern, Applied Multivariate Statistical Analysis, Pearson, 2007

5. **Lecture Plan:**

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

	distribution and inferential procedures.	distribution of sample mean and properties of point estimators, Other sampling methods	
5-6	It helps in understanding the concepts of hypotheses, and its errors followed by decision scenarios.	Interval estimation, Population mean when σ is known, Population mean σ is 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 on importance of variance, chi-square distributions and its types.	Inferences about difference of two 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 of designs and its types.	Testing the equality of population proportions, Test of independence, Goodness of fit test, Introduction to experimental design and Analysis of Variance (ANOVA) (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 on 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.	14,14.1,14.2,14.3,14.4,14.5,14.6,14.8.14.9 (T1)
15-17	It helps in	Multiple regression	15,15.1,15.2,15.3,15.4,15.5,15.6,15.8 (T1)

	understanding more than two variables in regression analysis and also gives insight on the concept of multicollinearity.	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.	
18-20	It gives exposure to distinguish between Categorial Independent and Categorical Dependent Regression Analysis.	Categorical independent variable, Logistic regression.	15.7,15.9 (T1)
21-23	It helps in assessing the classification accuracy of model.	Hoteling T^2 and Mahalanobis D^2 discriminant analysis, Objectives and its uses, Illustration of discriminant analysis, Assessing classification accuracy.	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	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.	7.1, 7.2, 7.3, 7.4 (R1)
32-35	It gives basic	Forecasting,	17.1 – 17.6 (T1), Class Notes

	idea on forecasting methods.	Components of a time series, Smoothing methods, Trend projections, Trend and seasonal components, Regression analysis, Qualitative approaches.	
36-37	It helps in understanding distribution free methods in parallel to parametric procedures.	Kruskal walls test, Mann Whitney Wilcoxon test, K-S two sample test	18.1-18.4 (T1), Class Notes
38-40	Statistical Quality Control	Introduction, Control charts for variables, Control charts attributes, Modified control charts.	19.1, 19.2 (T1), Class Notes

6. **Evaluation Scheme:**

EC. No	Evaluation Component	Duration	Weightage	Date & Time	Remarks
EC-1	Mid Semester	90 minutes	30		Closed Book
EC-2	Quizzes (Best 2 out of 3)	15 minutes each	10		Closed Book
	Assignment (one)	E-mail submission	15		Group work
EC-3	Comprehensive Exam.	180 minutes	45		Closed / Open Book

7. Chamber Consultation hours: To be announced in class.

8. Notices: All notices in relation to the above course will be put up on NALANDA.

9. Make up policy: Make up for mid-sem/comprehensive examination will be granted only in genuine cases. Permission must be taken in advance except in extreme cases. There will be no make up for the EC-2 at any circumstance.

Instructor in Charge
MATH F432