

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 | | 7,7.2,7.3,7.4,7.5,7.7,7.8 (T1) |



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| distribution and inferential procedures. distribution of sample mean and properties of procedures. 5-6 It helps in understanding the concepts of hypotheses, and its errors followed by decision Interval estimation, population mean when or is known, Population mean σ is unknown, Determining the sample size, Introduction to hypothesis testing, Types of errors, Inferences about square distributions and its types. 8,8.1,8.2,8.3 (T1) 7-8 To gain knowledge on importance of distributions and its types. Inferences about difference of two means, Inferences about population variances, Interval estimation. 10,10.1,10.2,10.3,11,11.1.1.12 (T1) 9-11 It helps us to gain knowledge to obtain accurate and reasonable allocations of resources. We general Multiple Testing the equality of population proportions, Test of independence, (ANOVA) 12,12.1,12.2,12.3 (T1) 9-11 It helps us to gain knowledge to obtain accurate and reasonable allocations of general Multiple Testing the equality of population proportions, Test of independence, (ANOVA) 12,12.1,12.2,12.3 (T1) 13,13.1,13.2,13.3,13.4 (T1) 13,13.1,13.2,13.3,13.4 (T1) review some general Multiple Completely randomized design, miniciples of designs and its Kandomized design | रगरा प्रम ब | | distribution of | |
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| 12-14 To gain Simple linear regression 14,14.1,14.2,14.3,14.4,14.5,14.6,14.8.14.9 | 12-14 | | Simple linear regression | 14,14.1,14.2,14.3,14.4,14.5,14.6,14.8.14.9 |
| knowledge on model, Least squares (T1) | | | | |
| basic regression method, Coefficient of | | | | |
| model. determination, Model | | • | - | |
| assumptions, Test for | | | , | |
| significance, Using the | | | · · | |
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| equation for estimation | | | * | |
| and prediction, Residual | | | - | |
| analysis: Validating | | | | |
| model assumptions, | | | | |
| outliers and influential | | | | |
| observations. | | | observations. | |
| 15-17 It helps in Multiple regression 15.15.1.15.2.15.3.15.4.15.5.15.6.15.8 (T1) | 15-17 | It helps in | Multiple regression | 15,15.1,15.2,15.3,15.4,15.5,15.6,15.8 (T1) |



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| | 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. | |
| 21-23 | It helps in assessing the classification accuracy of model. | $\begin{array}{c c} \mbox{Hoteling} & T^2 & \mbox{and} \\ \mbox{Mahalanobis} & D^2 \\ \mbox{discriminant} & \mbox{analysis,} \\ \mbox{Objectives and its uses,} \\ \mbox{Illustration} & \mbox{of} \\ \mbox{discriminant} & \mbox{analysis,} \\ \mbox{Assessing classification} \\ \mbox{accuracy.} \end{array}$ | 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 |



BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

Pilani Campus AUGS/ AGSR Division

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

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