**BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI**
**HYDERABAD CAMPUS**
**SECOND SEMESTER 2016-2017**
**COURSE HANDOUT (Part II)**

**12-01-2017**

In addition to Part I (General Handout for all courses appended to the time table) portion here give specific details regarding the course.

**Course Number** **: MATH F353**
**Course Title** **: Statistical Inference and Applications**
**Instructor-In charge** **: P.T.V. PRAVEEN KUMAR**

1. **Scope and objective of the course:**
   The goal of statistical inference is to study data with the intention of infering knowledge that goes beyond the immediate scope of the data. One usually focusses on two kinds of inferences: Estimation and testing of hypothesis. More specifically, the course deals with some of the statistical techniques of decision making. Both parametric and non-parametric methods will be discussed. Comparisons of two treatments is discussed, several treatments using analysis of variance is dealt with. Control charts for measurements and attributes will be discussed.
2. **Text Books:**
   Venkateswaran, S., & B. Singh, Operations Research, Notes-EDD, Vol.1 and 2, 1997.
3. **Reference Books:**
   1. Devore JL, Probability and Statistics for Engineering and the Sciences, 5th ed., Thomson, 2000
   2. Johnson, R.A.: Miller Freund's Probability and Statistics for engineers, 8th. Ed., PHI, 2005.
   3. Vijay K. Rohatgi: Statistical Inference: Dover Publications, Inc. New York, 2003.
4. **Lecture Plan:**

| Lecture | Learning Objectives | Topics to be covered | Chapter in the Text Book |
|---|---|---|---|

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|---|---|---|---|
| 1-6 | Probability theory makes predictions about experiments whose outcomes depend upon chance. Consequently, it lends itself beautifully to the use of computers as a mathematical tool to simulate and analyse experiments. Students will learn the theory,methods and practice of forming Judgements about the parameter of population and the reliability of statistical relationships, typically on the basis of random sampling. Students will learn the concepot of likelihood ratios and the concept of Hypothesis testing, possible coming of errors, power of the test ,Best Critical Regions and Uniformaly Most powerful Critical regions ,Generalised likelihood ratio tests. | Review of Elements of Probability Theory and Statistical Concepts. | Chapter 1 |
| 6-7 | | Classification of hypotheses as simple and composite, Distributional and parametric hypotheses. Examples | 2.1 to 2.2 |
| 8-9 | | Hypothesis testing in General Terminology | 2.3 to 2.4 |
| 10-11 | | Neymann Pearson's lemma, BCR (Simple vs. Simple hypotheses) | 2.5,2.5.1 |
| 12-13 | | UMPCR (Simple vs composite, composite vs composite). Monotone likelihood ratio and its application. | 2.5.2-2.5.3 |
| 14-15 | | GLRT (No derivation of GLRT need to be discussed. One example of derivation of GLRT, given in the book may be explained.) Use of various tests based on GLRT without derivation. | 2.6 |
| 16 | Students will learn to compare Parametric tests and Non parametric tests. Students learn to investigate the cause of | Approximate tests, paired t-test (Omit the derivations of GLRT but the results to be applied to numerical problems) | 2.7 |

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| 17 | rejection of the hypothesis in multiple comparison procedures. Identify the multiple applications where non parametric approaches are appropriate. | Testing of hypotheses about multinomial probabilities. | 2.8 |
| 18-19 | | Applications of the test in lect.1 (above) to distributional hypotheses and the resulting Chi-Square test of goodness of fit. | 3.2,3.3 |
| 20-21 | | Kolmogorov-Smirnov one sample test. | 3.4 |
| 22-24 | | Chi-Square test for independence and homogeneity | 3.5,3.6 |
| 25 | | Wilcoxon's test | 3.7,3.8,3.8.2 |
| 26-28 | | Sign test, Signed rank-sum test | 3.9,3.9.1,3.9.2 |
| 29-32 | Students learn the use of Analysis of Variance(ANOVA-one way, Two Way Classifications) when there are more than two inpendent popululations means to be compared. They learn basic experimental designs (CRD, RBD, and LSD). | Introduction and one-way classification (Fixed Effects Model) | 4.1,4.2 |
| 32-35 | | Randomized Block Design for one and classification, two-way classification (one observation per cell-interaction absent.) | 4.3,4.3.1,4.3.3 and 4.4 |
| 36-37 | | Latin Square Design and missing values | 4.5,4.6 |
| 38-39 | | Test for testing the equality of variances | 4.7 |

**5. Evaluation Scheme:**

| EC No. | Evaluation Component | Duration | Max Marks | Date & Time | Remarks |
|---|---|---|---|---|---|
| 1 | TEST 1 | 1 hour | 20% | 28/2, 11.30 -12.30 PM | Closed Book |
| 2 | TEST 2 | 1hour | 20% | 31/3, 11.30 -12.30 PM | Closed Book |
| 3 | Assignment/Seminars (R- software to be used) | -- | 20% | | Open Book |
| 3 | COMPRE | 3 Hours | 40% | 04/05 AN | Closed Book |

**Announcements:**

All notices in relation to above course will be put up on the notice board of Mathematics Department/CMS.

6. **Mid-semester grading:**
   It will be announced normally in the month of March. It is done in the same manner as that of the final grading.
7. **Make up policy:**

   Make up will be granted only in genuine cases. Permission must be taken in advance except in extreme cases.

8. **Chamber consultation hours:** Will be announced in the class.

**Instructor In charge**
**MATH F353**