Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2023-2024

Course Handout Part II

Date: 09.01.2024

In addition to Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : ***MATH F353***
Course Title : ***Statistical Inference and Applications***
Instructor-in-Charge : ***Sayan Ghosh***

Scope and Objective of the Course:

The goal of statistical inference is to study data with the intention of inferring knowledge that goes beyond the immediate scope of the data. One usually focusses on two kinds of inference: 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. Comparison of two treatments and several treatments using analysis of variance is also dealt with.

Textbooks:

1. Venkateswaran, S., & B. Singh, Operations Research, Notes-EDD, Vol.1 and 2, 1997

Reference books:

1. Vijay K. Rohatgi: Statistical Inference: Dover Publications, Inc. New York, 2003.
2. Michael W. Trosset, An Introduction to Statistical Inference and Its Applications with R, CRC Press, 2009.
3. Devore JL, Probability and Statistics for Engineering and the Sciences, 5th ed., Thomson, 2000
4. Johnson, R.A.: Miller Freund's Probability and Statistics for engineers, 8th. Ed., PHI, 2005.

Course Plan:

Lecture	Learning Objectives	Topics to be covered	Chapter in the Text Book
1-7	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 analyze 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 concept of likelihood ratios and the concept of Hypothesis testing, possible coming of errors, power of the test, Best Critical Regions and Uniformly Most powerful Critical regions, Generalized likelihood ratio tests.	Review of Elements of Probability Theory and Statistical Concepts.	Chapter 1
8-9		Classification of hypotheses as simple and composite, Distributional and parametric hypotheses. Examples	2.1 to 2.2
10-11		Hypothesis testing in General Terminology	2.3 to 2.4
12-13		Neyman Pearson's lemma, BCR (Simple vs. Simple hypotheses)	2.5,2.5.1
14-15		UMPCR (Simple vs composite, composite vs composite). Monotone likelihood ratio and its application.	2.5.2-2.5.3
16-17		GLRT (No derivation of GLRT needs 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
18	Students will learn to compare Parametric tests and Non parametric tests. Students learn to investigate the cause of rejection of the hypothesis in multiple comparison procedures. Identify multiple applications where non parametric approaches are appropriate.	Approximate tests, paired t-test (omit the derivations of GLRT but the results to be applied to numerical problems)	2.7
19		Testing of hypotheses about multinomial probabilities.	2.8
20-22		Applications of the test in lect.1 (above) to distributional hypotheses and the resulting Chi-Square test of	3.2,3.3

		goodness of fit.	
23-24		Kolmogorov-Smirnov one sample test.	3.4
25-26		Chi-Square test for independence and homogeneity	3.5,3.6
27-28		Wilcoxon's test	3.7,3.8,3.8.2
29-31		Sign test, Signed rank-sum test	3.9,3.9.1,3.9.2
32-33	Students learn the use of Analysis of Variance (ANOVA-one way, Two Way Classifications) when there are more than two independent populations 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
34-37		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
38-40		Latin Square Design and missing values, Test for the equality of variances	4.5,4.6,4.7

Evaluation Scheme:

EC No.	Evaluation Component	Duration	(Total Marks= 100) Weightage (%)	Date & Time	Nature of Component
1.	Quizzes (2)	30 min	20%	To be announced	Open Book
2.	Mid Semester	90 min	30%	15/03 - 4.00 - 5.30PM	Closed Book
3.	Assignment (1)	To be announced	10%	To be announced	Open Book
4.	Comprehensive	180 min	40%	17/05 AN	Closed Book

Chamber Consultation Hour: Will be announced in the class.

Notices: All notices in relation to above course will be put up on CMS or Google classroom..

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

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