Semester	**SIX**
Paper Number	**HSTCR6142T & HSTCR6142P**
Paper Title	**Multivariate Analysis and Non Parametric Methods**
No. of Credits	**6**
Theory/Composite	**Composite**
No. of periods assigned	Th: 4 Pr: 3
Module	single
Course description/objective	*At the end of the course students should know* o About Multivariate Probability Distribution. o Multinomial and Multivariate Normal distributions along with their properties. o Sampling distributions of some statistics drawn from Multivariate Normal distribution. o Application of multivariate techniques in Principal Component Analysis o Application of multivariate techniques in Principal Component Analysis Discriminant Analysis. o Different nonparametric tests for location, scale and randomness.
Syllabus	**UNIT I:** *Random Vector:* Probability mass/density functions, Distribution function, Mean vector & Dispersion matrix, Marginal & Conditional distributions. [6L] **UNIT 2:** Multinomial Distribution, Multivariate Normal distribution and its properties [12L]. Sampling distribution for mean vector and variance- covariance matrix (Statement only) [5L] Multiple and partial correlation coefficient and their properties.[5L] **UNIT 3:** *Applications of Multivariate Analysis:* Discriminant Analysis, Principal Components Analysis. [12L] **UNIT 4:** *Nonparametric Tests:* Introduction and Concept, Test for randomness based on total number of runs, Empirical distribution function, Kolmogrov Smirnov test for one sample, Sign tests- one sample and two samples, Wilcoxon-Mann-Whitney test, Kruskal-

	Wallis test. [12L]
List of Practical	1. Multiple Correlation 2. Partial Correlation 3. Multivariate Normal Distribution 4. Multinomial Distribution 5. Discriminant Analysis 6. Principal Components Analysis 7. Test for randomness based on total number of runs, 8. Kolmogrov Smirnov test for one sample. 9. Sign test: one sample, two samples, large samples. 10. Wilcoxon-Mann-Whitney U-test 11. Kruskal-Wallis test
Reading/Reference Lists	1. Anderson, T.W. (2003): An Introduction to Multivariate Statistical Analysis, 3rdEdn., John Wiley 2. Muirhead, R.J. (1982): Aspects of Multivariate Statistical Theory, John Wiley. 3. Kshirsagar, A.M. (1972) :Multivariate Analysis, 1stEdn. Marcel Dekker. 4. Johnson, R.A. and Wichern, D.W. (2007): Applied Multivariate Analysis, 6thEdn., Pearson & Prentice Hall 5. Mukhopadhyay, P. (2006) : Mathematical Statistics. 3rd Edn, Books and Allied limited, Kolkata. 6. Gibbons, J. D. and Chakraborty, S (2003): Nonparametric Statistical Inference. 4th Edition. Marcel Dekker, CRC.

Evaluation	Theory	Practical
	CIA: 10 End-Sem: 50 Total: 60	Continuous assessment: 40
Paper Structure for End Sem Theory	Short questions (5 marks each)	Long questions (15 marks each)
	4 out of 6	2 out of 3