

Semester	<b>FOUR</b>
Paper Number	<b>HSTCR4082T</b>
Paper Title	<b>Statistical Inference 2</b>
No. of Credits	<b>6</b>
Theory/Composite	<b>Composite</b>
No. of periods assigned	Th: 4 Pr: 3
Module	Single
Course description/objective	<p><i>At the end of the course a student should</i></p> <ul style="list-style-type: none"> <li>○ Understand the basic notions of point estimation.</li> <li>○ Visualise the notion of MVUE.</li> <li>○ Know the different methods to generate point estimators.</li> <li>○ Understand the Neyman Pearson approach to tests of significance</li> <li>○ Understand the Likelihood approach to tests of significance and its general applicability.</li> <li>○ Understand the link between the Neyman Pearson and Likelihood approach.</li> <li>○ Understand the basic difference between a fixed sample approach and the sequential approach to testing of hypotheses.</li> </ul>
Syllabus	<p><b>UNIT 1:</b>  <b><i>Estimation:</i></b> Concepts of estimation, unbiasedness, mean square error, sufficiency, completeness and exponential family of distributions.  [6L]  Factorization theorem. Minimum variance unbiased estimator (MVUE), Rao-Blackwell and Lehmann-Scheffe theorems and their applications.  [10L]  Cramer-Rao inequality (statement and applications) and MVB estimators  [4L]</p> <p><b>UNIT 2:</b>  <b><i>Methods of Estimation:</i></b> Method of moments, method of maximum likelihood estimation, method of minimum Chi-square  [8L]</p> <p><b>UNIT 3:</b>  <b><i>Principles of test of significance:</i></b> Most powerful test, uniformly most powerful test, Neyman Pearson Lemma (statement and applications to construct most powerful test), Unbiased test.  [10L]  Likelihood ratio test, properties of likelihood ratio tests (without proof)</p>

	<p>[3L]</p> <p><b>UNIT 4:</b>  <i>Sequential Analysis:</i> Sequential probability ratio test (SPRT) for simple vs simple hypotheses. [3L]  Fundamental relations among <math>\alpha</math>, <math>\beta</math>, A and B, determination of A and B in practice.  [4L]  Wald's fundamental identity and the derivation of operating characteristics (OC) and average sample number (ASN) functions. Examples based on Normal, Poisson, Binomial and Exponential distributions.  [4L]</p>
List of Practical	<ol style="list-style-type: none"> <li>1. Unbiased estimators (including unbiased but absurd estimators)</li> <li>2. Cramer-Rao inequality and MVB estimators</li> <li>3. Sufficient Estimators – Factorization Theorem, Rao-Blackwell theorem, Complete Sufficient estimators</li> <li>4. Lehman-Scheffe theorem and UMVUE</li> <li>5. Maximum Likelihood Estimation</li> <li>6. Estimation by the method of moments, minimum Chi-square</li> <li>7. Most powerful critical region (NP Lemma)</li> <li>8. Uniformly most powerful critical region</li> <li>9. Unbiased critical region</li> <li>10. Power curves</li> <li>11. Likelihood ratio tests for simple null hypothesis against simple alternative hypothesis</li> <li>12. Likelihood ratio tests for simple null hypothesis against composite alternative hypothesis</li> <li>13. Asymptotic properties of LR tests</li> <li>14. SPRT procedure</li> <li>15. OC function and OC curve</li> <li>16. ASN function and ASN curve</li> </ol>
Reading/Reference Lists	<ol style="list-style-type: none"> <li>1. Goon A.M., Gupta M.K.: Das Gupta.B. (2005), Fundamentals of Statistics, Vol. I, World Press, Calcutta.</li> <li>2. Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics. 2<sup>nd</sup> Edn. (Reprint) John Wiley and Sons.</li> <li>3. Miller, I. and Miller, M. (2002) : John E. Freund's Mathematical Statistics (6th addition, low price edition), Prentice Hall of India.</li> <li>4. Dudewicz, E. J., and Mishra, S. N. (1988): Modern Mathematical Statistics. John Wiley &amp; Sons.</li> <li>5. Mood A.M, Graybill F.A. and Boes D.C (2001) : Introduction to the Theory of Statistics, McGraw Hill, New Delhi.</li> <li>6. Bhat B.R, Srivenkatramana T and Rao Madhava K.S.</li> </ol>

	(1997) Statistics: A Beginner's Text, Vol. I, New Age International (P) Ltd. 7. Snedecor G.W and Cochran W.G.(1967) Statistical Methods. Iowa State University Press.	
Evaluation	<b>Theory</b> CIA: 10 End-Sem: 50 Total: 60	<b>Practical</b> 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