

M. G. Science Institute, Ahmedabad

Autonomous | Affiliated to Gujarat University, Ahmedabad

(Managed by The Ahmedabad Education Society)

Department of Statistics

Bachelor of Science (Hons.) in Statistics

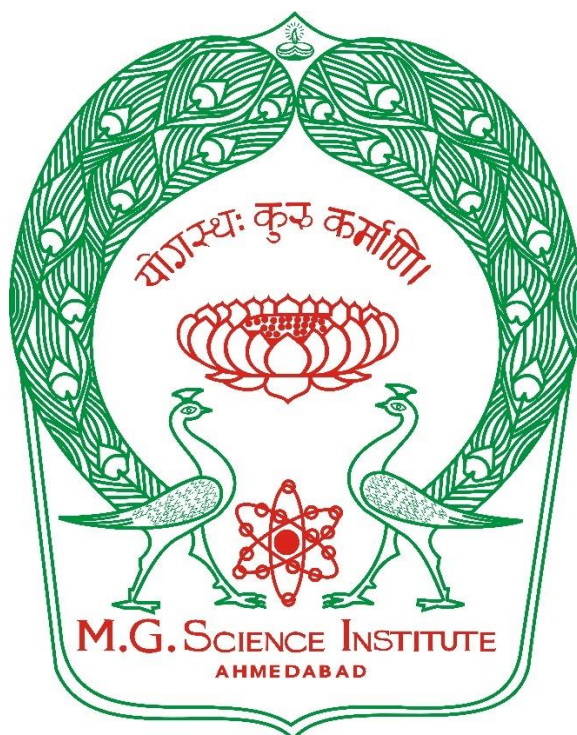
B.Sc. (Hons.) Statistics

4 Year, 8 Semester Full-Time Programme

Choice Based Credit System (CBCS) & Grading System

Outcome-Based Education Pattern

(Effective from Academic Year 2024-25)



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Detailed Syllabus for Each Course B.Sc. (Hons.) Statistics

STM352 Statistical Inference

Semester: V	Course Title: Statistical Inference	Credit: 4
Course No.: STM352		Hours: 4/week

Course Outcomes: On successful completion of the course the learner will be able to

CO	COGNITIVE ABILITIES	COURSE OUTCOMES
CO 1	REMEMBERING	Recall fundamental concepts of estimation, interval estimation, and hypothesis testing.
CO 2	UNDERSTANDING	Explain properties of estimators and describe methods of estimation and testing procedures.
CO 3	APPLYING	Apply methods of moments, maximum likelihood, and hypothesis testing to solve statistical problems.
CO 4	ANALYSING	Analyse the efficiency and sufficiency of estimators and interpret results in statistical inference.
CO 5	EVALUATING	Evaluate the performance of different estimators and tests using criteria such as unbiasedness, variance, and optimality.
CO 6	CREATING	Design appropriate confidence intervals, estimators, and hypothesis tests for given statistical situations.

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	1	0	0
CO 2	2	3	2	1	0
CO 3	1	2	3	2	1
CO 4	0	1	2	3	2
CO 5	0	1	2	3	3
CO 6	0	0	1	2	3

Unit	Detailed Syllabus	No. of Hours of Teaching
I	<p>Theory of Estimation</p> <ul style="list-style-type: none"> - Notion of parameter, parameter space, General problem of estimating an unknown parameter by point estimation - Concepts of statistic and estimator, Properties of Estimator: unbiasedness, consistency, sufficiency, efficiency - Factorization theorem on sufficiency – discrete case only - Fisher's information contained in sample and its use in sufficient statistics - Minimum Variance Unbiased estimator (MVUE) - definition and properties – Rao-Cramer inequality and Related examples 	15
II	<p>Methods of Estimation</p>	15

	<ul style="list-style-type: none"> - Method of moments, Examples. - Method of maximum likelihood with properties (statements only) and examples. - Method of scoring, Examples 	
III	<p>Interval Estimation</p> <ul style="list-style-type: none"> - Notion of interval estimation, definition of confidence interval, confidence bounds. - Definition of pivotal quantity and its use in obtaining confidence interval and bounds. - Interval estimation for the following cases: <ul style="list-style-type: none"> (i) Mean (μ) of normal distribution (when σ known and σ unknown) (ii) Variance (σ^2) of normal distribution (when μ known and μ unknown) (iii) Difference of two means $\mu_1 - \mu_2$ (a) for a sample from bivariate normal population (b) for samples from two independent normal populations (iv) Population proportion (P) and difference of two population proportions ($P_1 - P_2$) in case of two independent large samples. (v) The ratio of two population variances (when population mean known and population mean unknown) 	15
IV	<p>Testing of Hypothesis</p> <p>Null hypothesis, Alternative hypothesis, simple and composite hypothesis, critical region, Type- I & type-II Errors, level of significance, size of the test, power of the test, N-P Lemma, MP and UMP tests, examples based on N-P Lemma. Concept of LRT.</p> <p>Large Sample test:</p> <p>Test of significance of population Mean, Relation between confidence interval and testing of hypothesis, Test of Significance of difference between two means, Test of significance of Population Proportion, Test of Significance of difference between two population proportions.</p>	15

Suggested Reference Books:

1. Applied Statistics, Publisher: Books & Allied (P) Ltd. Mukhopadhyay P. (2015).
2. Hogg, R.V. and Craig, A.T. (1972): Introduction to Mathematical Statistics, Amerind Publishing Co.
3. Mood, A.M., Greybill, F.A. and Bose, D.C. (1974): Introduction to the Theory of
4. Statistics, McGraw Hill.
5. Mukhopadhyay, P. (1996): Mathematical Statistics, New Central Book Agency.
6. Rohtagi, V.K. (1967): An Introduction to Probability Theory and Mathematical Statistics, John Wiley and Sons.
7. Hoel, P.G. (1971): Introduction to Mathematical Statistics, Asia Publishing House.
8. Meyer, P.L. (1970): Introductory Probability and Statistical Applications, Addison Wesley.

9. Gupta, S.C., and Kapoor, V.K. Fundamentals of Mathematical Statistics, Sultan Chand Publications.
10. Goon, A.M., Gupta, M.K. and Das Gupta, B. (1991): Fundamentals of Statistics, Vol. I, World Press, Calcutta.
11. A First Course in Probability - Sheldon. M. Ross, (Mc Millian Publishing Co.)
12. Introduction to Probability and Statistics for Engineers and Scientists-S.M. Ross (Elsevier)