



C. U. SHAH UNIVERSITY



**C. U. SHAH UNIVERSITY
WADHWAN CITY
FACULTY OF SCIENCES**

B.Sc.

SEM-III

**Syllabi (CBCS)
Statistics**



FACULTY OF SCIENCES

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc.

SEMESTER: III

SUBJECT NAME: Descriptive Statistics and Probability Theory

SUBJECT CODE: 4SC03DSP1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
Th	Tu	Pr	Total		Theory				Practical			Total Marks
					Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
3	0	0	3	3	30	1.5	70	3	--	--	--	100

Objectives: -The objectives of this course are

- To understand the concept of data analysis.
- To analyze the measures of central tendency and dispersions.
- To understand concept of regression analysis for the data and forecasting.

Prerequisites: - Students must be familiar with the use of scientific calculator with statistical operations.

Course outline:-

Sr. No.	Course Contents	Hours
1	Concepts of a statistical population and sample from a population, quantitative and qualitative data, nominal, ordinal and time-series data.	09
2	Discrete and continuous data. Presentation of data by tables and by diagrams, frequency distributions for discrete and continuous data, graphical representation of a frequency distribution by histogram and frequency polygon.	09
3	Cumulative frequency distributions (inclusive and exclusive methods). Measures of location (or central tendency) and dispersion, moments, measures of skewness and kurtosis, cumulates, Principle of least-square and fitting of polynomials and exponential curves.	09



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4	Bivariate data: Scatter diagram, Correlation and regression. Karl Pearson coefficient of correlation, Lines of regression, Spearman's rank correlation coefficient, multiple and partial correlations (for 3 variates only). Random experiment, sample point and sample space, event, algebra of events, Definition of Probability - classical, relative frequency and axiomatic approaches to probability.	09
5	Merits and demerits of these approaches (only general ideas to be given). Theorem on probability, conditional probability, independent events. Baye's theorem and its applications	09

Learning Outcomes:-

After the successful completion of the course, students will be able to

- Understand the concept of data analysis.
- Analyze the measures of central tendency and dispersions.
- Understand concept of regression analysis for the data and forecasting.

Books Recommended:-

1. 'Mathematical Statistics with Applications 7th Ed', **J.E. Freund**, *Pearson Education*, 2009.
2. 'Fundamentals of Statistics, Vol. I, 8th Ed.', **A.M. Goon, M.K. Gupta and B. Dasgupta**, *World Press, Kolkatta*, 2005.
3. 'Fundamentals of Mathematical Statistics, 11th Ed.', **S.C. Gupta and V.K. Kapoor**, *Sultan Chand and Sons*, 2007.
4. 'Introduction to Mathematical Statistics, 6th Ed.', **R.V. Hogg, A.T. Craig and J.W. Mckean**, *Pearson Education*, 2005.
5. 'Introduction to the Theory of Statistics, 3rd Ed.', **A.M. Mood, F.A. Graybill and D.C. Boes**, *Tata McGraw Hill Publication*, 2007.

E-Resources:-

1. www.purplemath.com/modules/meanmode.htm
2. <https://www.utdallas.edu/~ammann/stat3355/node10.html>
3. http://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704_Multivariable/BS704_Multivariable5.html



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCES

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc.

SEMESTER: III

SUBJECT NAME: Statistical Methods

SUBJECT CODE: 4SC03STM1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
3	0	0	3	3	30	1.5	70	3	--	--	--	100	

Objectives: -The objectives of this course are

- To understand concept of different random variables from given data.
- To analysis the probabilistic model of data structure.

Prerequisites: - Students must be familiar with the use of scientific calculator with statistical operations.

Course outline:-

Sr. No.	Course Contents	Hours
1	Random variables: Discrete and continuous random variables, p.m.f., p.d.f. and c.d.f.	09
2	Illustrations of random variables and its properties, expectation of random variable and its properties. Moments and cumulants, moment generating function, cumulants generating function and characteristic function.	09
3	Transformation in univariate and bivariate distributions. Bivariate probability distributions; marginal and conditional distributions.	09
4	Discrete distributions: Independence of variates (only general idea to be given). Point (or degenerate), Binomial, Poisson, Geometric, negative binomial, Hyper geometric.	09
5	Continuous distributions: Normal, Uniform, Exponential, Beta and Gamma distributions, Statement and application of Chebychev's inequality, WLLN and SLLN, Central limit theorem (CLT) for i.i.d. variates, and its application,. De Moivre's Laplace Theorem.	09



Learning Outcomes:-

After the successful completion of the course, students will be able to

- Understand concept of different random variables from given data.
- Analysis the probabilistic model of data structure.

Books Recommended:-

1. 'An outline of Statistical Theory (Vol. I), 4th Ed ', **A.M. Goon, M.K. Gupta and B. Dasgupta**, World Press, Kolkata, 2003.
2. 'Fundamentals of Mathematical Statistics, 11th Ed.', **S.C. Gupta and V.K. Kapoor**, Sultan Chand and Sons, 2007.
3. ' Introduction to Mathematical Statistics, 6th Ed ' **R.V. Hogg, A.T. Craig, and J.W. Mckean**, Pearson Education, 2005.
4. ' Introduction to the Theory of Statistics, 3rd Ed.', **A.M. Mood, F.A. Graybill and D.C. Boes**, Tata McGraw Hill Publication, 2007.
5. 'An Introduction to Probability and Statistics, 2nd Edition', **V.K. Rohtagi and A.K. Md. E. Saleh**, John Wiley and Sons, 2009.
6. 'Introduction to Probability Models, 9th Ed.,' **S.A. Ross**, Academic Press, 2007.

E-Resources:-

1. <https://www.mathsisfun.com/definitions/bivariate-data.html>
2. <https://onlinecourses.science.psu.edu/stat414/node/92>
3. https://en.wikipedia.org/wiki/Joint_probability_distribution
4. <https://turing.une.edu.au/~stat354/notes/node25.html>
5. www.math.uah.edu/stat/special/Beta.html



FACULTY OF SCIENCES

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc.
SUBJECT NAME: Statistical Inference

SEMESTER: III
SUBJECT CODE: 4SC03STI1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
3	0	0	3	3	30	1.5	70	3	--	--	--	100	

Objectives: -The objectives of this course are

- To understand the methods of statistical estimation and forecasting.
- To understand the different confidence level of estimations.
- To analyze the different tool like like hood ratio test, UMP test etc.

Prerequisites:- Students must be familiar with the use of scientific calculator with statistical operations

Course outline:-

Sr. No.	Course Contents	Hours
1	Estimation: Parameter space, sample space, point estimation, requirement of a good estimator, consistency.	09
2	Unbiasedness, efficiency, sufficiency, Minimum variance unbiased estimators. Cramer-Rao inequality (Statement only). Methods of estimation: maximum likelihood, least - squares and minimum variance.	09
3	Statement of Rao-Blackwell theorem and Lehmann-Scheffe theorem. Properties of maximum likelihood estimators (illustration). Interval Estimation: confidence intervals for the parameters of normal distribution.	09



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4	Confidence intervals for difference of mean and for ratio of variances. Testing of Hypothesis: Statistical Hypothesis, simple and composite hypotheses, null and alternative hypotheses, Critical region, Two kinds of errors, Level of significance and power of a test. MP test and region. Neyman-Pearson lemma (statement only).	09
5	Likelihood ratio test, UMP test, UMPU test, Critical regions for simple hypothesis for one parameter. Non-Parametric Tests: One sample and two sample sign test, Wald-Wolfowitz run test, run test for randomness, Median test and Wilcoxon-Mann-Whitney test (derivation not required, give stress on examples).	09

Learning Outcomes:-

After the successful completion of the course, students will be able to

- Understand the methods of statistical estimation and forecasting.
- Understand the different confidence level of estimations.
- Analyze the different tool like likelihood ratio test, UMP test etc.

Books Recommended:-

1. 'Statistical Inference, 2nd Ed.', **G. Casella and R.L. Berger**, Thomson Duxbury, 2002
2. 'Modern Mathematical Statistics', **E.J. Dudewicz and S.N. Mishra**, John Wiley and Sons, 1988.
3. 'Non Parametric Statistical Inference, 4th Ed.', **J.D. Gibbons and S. Chakraborty**, Marcel Dekkar, CRC, 2003.
4. 'An Outline of Statistical Theory (Vol. I), 4th Ed 'A.M. Goon, M.K. Gupta and B. Dasgupta, World Press, Kolkata, 2003.
5. 'Fundamentals of Mathematical Statistics, 11th Ed 'S.C. Gupta and V.K. Kapoor,Sultan Chand and Sons, 2007.
6. 'The Advanced Theory of Statistics (Vol. III)',**M.G. Kendall and A. Stuart**, Macmillan Publishing Co., Inc., 1977..
7. 'Introduction to Mathematical Statistics', **R.V. Hogg, A.T. Craig and J.W. Mckean**, 6th Ed. Pearson Education, 2005..
8. ' An Introduction to Probablity and Statistics, 2nd Ed.', **V.K. Rohtagi and A.K. Md. E. SalehJohn**, Wiley and Sons, 2009.

E-Resources:-

1. faculty.cas.usf.edu/mbrannick/.../4%20Sampling%20Distributions.ppt
2. https://en.wikipedia.org/wiki/Statistical_hypothesis_testing
3. math.arizona.edu/~jwatkins/ump.pdf
4. <https://www.statisticssolutions.com/wald-wolfowitz-run-test/>



FACULTY OF SCIENCES

DEPARTMENT OF MATHEMATICS

COURSE: B.Sc.

SEMESTER: III

SUBJECT NAME: Statistics Practical-I

SUBJECT CODE: 4SC03STP1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
0	0	6	6	3	-	-	--	-	20	10	70	100	

Objectives: -The objectives of this course are

- To understand the statistical tool for estimation and forecasting.
- To analyze the data with different parameters like measures of central tendency, dispersion, regression etc.

Prerequisites: - Students must be familiar with the use of scientific calculator with statistical Operations.

Course outline:-

Sr. No.	Course Contents	Hours
1	Problems based on Random variables.	02
2	Problems based on Bivariate probability distributions, marginal and conditional distributions.	02
3	Problems based on Beta and Gama distributions.	02
4	Problems based on Testing of Hypothesis.	02
5	Problems based on Likelihood ratio test, UMP test, UMPU test.	02
6	Problems based on Median test and Wilcoxon-Mann-Whitney test.	02
7	Problems based on graphical representation of a frequency distribution by histogram and frequency polygon.	02



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8	Problems based on Measures of location (or central tendency) and dispersion, moments.	02
9	Problems based on measures of skewness and kurtosis.	02
10	Problems based on Theorem on probability, conditional probability.	02
11	Problems based on independent events.	02
12	Problems based on Baye's theorem and its applications.	02

Learning Outcomes:-

After the successful completion of the course, students will be able to

- Understand the statistical tool for estimation and forecasting
- Analyze the data with different parameters like measures of central tendency, dispersion, regression etc.

Books Recommended:-

1. 'Statistical Inference, 2nd Ed.', **G. Casella and R.L. Berger**, Thomson Duxbury, 2002.
2. 'Modern Mathematical Statistics', **E.J. Dudewicz and S.N. Mishra**, John Wiley and Sons, 1988.
3. 'Non Parametric Statistical Inference, 4th Ed.', **J.D. Gibbons and S. Chakraborty**, Marcel Dekkar, CRC, 2003.
4. 'An Outline of Statistical Theory (Vol. I), 4th Ed ', **A.M. Goon, M.K. Gupta and B. Dasgupta**, World Press, Kolkata, 2003.
5. 'Fundamentals of Mathematical Statistics, 11th Ed ', **S.C. Gupta and V.K. Kapoor**, Sultan Chand and Sons, 2007.
6. 'The Advanced Theory of Statistics (Vol. III)', **M.G. Kendall and A. Stuart**, Macmillan Publishing Co., Inc., 1977.
7. 'Introduction to Mathematical Statistics', **R.V. Hogg, A.T. Craig and J.W. Mckean**, 6th Ed. Pearson Education, 2005.
8. 'An Introduction to Probability and Statistics, 2nd Ed.', **V.K. Rohtagi and A.K. Md. E. SalehJohn**, Wiley and Sons, 2009.

E-Resources:-

1. <https://www.mathsisfun.com/definitions/bivariate-data.html>
2. <https://onlinecourses.science.psu.edu/stat414/node/92>
3. https://en.wikipedia.org/wiki/Joint_probability_distribution