

U.G. 2nd Semester

Paper: STA201C (Core)

Probability- II

Credits: 5 = 4+0+1 (64 Lectures)

UNIT I (Lectures: 20)

Discrete Probability Distributions: Uniform, Binomial, Poisson, Geometric, Negative Binomial and Hypergeometric distributions along with their characteristic properties and limiting/approximation cases.

UNIT II (Lectures: 20)

Continuous probability distributions: Normal, Exponential, Uniform, Beta, Gamma, Cauchy, lognormal, Laplace and Weibull distributions along with their characteristic properties and limiting/approximation cases.

UNIT III (Lectures: 16)

Limit laws: convergence in probability, almost sure convergence, convergence in mean square and convergence in distribution and their inter relations, Chebyshev's inequality, W.L.L.N., S.L.L.N. and their applications, De-Moivre Laplace theorem, Central Limit Theorem (C.L.T.) for i.i.d. variates (Lindeberg-Levy), Applications of C.L.T. and Liapunov Theorem (without proof).

UNIT IV (Lectures: 08)

Order Statistics: Introduction, distribution of the r^{th} order statistic, smallest and largest order statistics. Joint distribution of r^{th} and s^{th} order statistics, distribution of sample median and sample range.

PRACTICAL/ LAB. WORK: (Lectures: 16)

List of Practicals

1. Fitting of binomial distributions for n and $p = q = \frac{1}{2}$
2. Fitting of binomial distributions for given n and p .
3. Fitting of binomial distributions after computing mean and variance.
4. Fitting of Poisson distributions for given value of λ .
5. Fitting of Poisson distributions after computing mean.
6. Fitting of negative binomial distribution.
7. Fitting of normal distribution when parameters are given.
8. Fitting of normal distribution when parameters are not given.

SUGGESTED READING:

1. Feller, W (1993): An Introduction to Probability Theory and its Applications, Vol I, 9th Edition, Wiley Eastern Publication.
2. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2003): An Outline of Statistical Theory, Vol. I, 4th Edn. World Press, Kolkata.
3. Gupta S.C and Kapoor V.K (2007): Fundamentals of Mathematical Statistics, 11th Edition, Sultan Chand & Sons.
4. Hogg, R.V. and Tanis, E.A. (2009): A Brief Course in Mathematical Statistics. Pearson Education.

5. Johnson, R.A. and Bhattacharya, G.K. (2001): Statistics-Principles and Methods, 4th Edn. John Wiley and Sons.
6. Mood, A.M., Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn. (Reprint).Tata McGraw-Hill Pub. Co. Ltd.
7. Rohatgi V. K. and Saleh, A.K. Md. E. (2009): An Introduction to Probability and Statistics. 2ndEdn. (Reprint) John Wiley and Sons.

Paper: STA202C (Core)

Algebra

Credits: 5=4+0+1 (64 Lectures)

UNIT I (Lectures: 8)

Idea of Group, Ring and Field, Vector spaces, Subspaces, sum of Subspaces, Span of a set, Linear dependence and independence, Dimension and Basis, Dimension theorem.

UNIT II (Lectures: 20)

Algebra of matrices - A review, theorems related to triangular, symmetric and skew symmetric matrices, Idempotent matrices, Hermitian and skew Hermitian matrices, Orthogonal matrices, Singular and Non-singular matrices and their properties. Trace of a matrix, Unitary, Involutory and Nilpotent matrices. Adjoint and Inverse of a matrix and related properties

UNIT III (Lectures: 20)

Determinants of Matrices: Definition, properties and applications of determinants for 3rd and higher orders, evaluation of determinants of order 3 and more using transformations. Symmetric and Skew symmetric determinants, product of determinants.

Use of determinants in solution to the system of linear equations, row reduction and echelon forms, the matrix equations $AX=B$, solution sets of linear equations, linear independence, Applications of linear equations, inverse of a matrix.

UNIT IV (Lectures: 16)

Rank of a matrix, row-rank, column-rank, standard theorems on ranks, rank of the sum and the product of two matrices. Partitioning of matrices. Characteristic roots and Characteristic vectors, Properties of characteristic roots, Cayley Hamilton theorem, Quadratic forms.

PRACTICAL/LAB. WORK: (Lectures: 16)

List of Practicals

1. Finding systems of non homogeneous linear equations using Cramer's Rule
2. Finding inverse of a matrix by partitioning
3. Reducing a matrix to echelon form and finding its rank.
4. Reducing a matrix to canonical form and finding its rank.
5. Finding of characteristic roots and vectors of a matrix.

6. Finding the inverse of a matrix by using the concept of rank
7. Applications based on systems of linear non - homogeneous equations
8. Finding inverse using Cayley Hamilton theorem
9. Proving that a quadratic form is positive or negative definite.
10. Finding two non singular matrices P and Q such that PAQ is in normal form.

SUGGESTED READINGS:

1. Artin M. (1994): Algebra. Prentice Hall of India.
2. Biswas, S. (1997): A Textbook of Matrix Algebra, New Age International.
3. Gupta S.C (2008): An Introduction to Matrices (Reprint). Sultan Chand & Sons.
4. Hadley G. (2002): Linear Algebra. Narosa Publishing House (Reprint).
5. Jain P.K. and Khalil Ahmad (1973): Metric Spaces, Narosa Publishing House, New Delhi.
6. Krishnamurthy V., Mainra V.P. and Arora J.L (1976): An Introduction to Linear Algebra (II,III, IV, V).
7. Lay David C (2000): Linear Algebra and its Applications, Addison Wesley,.
8. Searle S.R (1982): Matrix Algebra Useful for Statistics. John Wiley & Sons.
9. Vasishtha, A.R. (1982): Matrices. 9th Edition , Krishna Prakashan Mandir.

Paper: STA203G (General Elective) Statistical Methods

Credits: 4 = 3+0+1 (48 Lectures)

UNIT I (Lectures: 8)

Statistical Methods: Concepts of statistical population and sample. Data: Quantitative and qualitative, Time series and spatial, variables- discrete and continuous, scales of measurement- nominal, ordinal, interval and ratio.

Presentation of data: Classification, tabulation, frequency distribution and graphical representation of data.

UNIT II (Lectures: 12)

Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, moments, skewness and kurtosis.

UNIT III (Lectures: 12)

Bivariate data: Definition, scatter diagram, simple correlation, rank correlation. Simple linear regression, principle of least squares and fitting of polynomials and exponential curves.

Theory of attributes, consistency of data, independence and association of attributes, measures of association and contingency.

UNIT IV (Lectures: 16)

Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability – classical, statistical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem and its applications.

PRACTICAL/ LAB WORK (Lectures: 16)

List of Practicals

1. Graphical representation of data
2. Problems based on measures of central tendency
3. Problems based on measures of dispersion
4. Problems based on combined mean and variance and coefficient of variation
5. Problems based on moments, skewness and kurtosis
6. Fitting of polynomials, exponential curves
7. Karl Pearson correlation coefficient
8. Partial and multiple correlations
9. Spearman rank correlation with and without ties.
10. Correlation coefficient for a bivariate frequency distribution
11. Lines of regression, angle between lines and estimated values of variables.
12. Checking consistency of data and finding association among attributes.

SUGGESTED READING:

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.
2. Gupta S.C and Kapoor V.K (2007): Fundamentals of Mathematical Statistics, 11th Edition, Sultan Chand & Sons.
3. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
4. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.