

DETAILED COURSES OF READING

B.Sc. (HONS.) STATISTICS

Semester I: Examination 2011 and onwards

Paper STH 101: Technical Writing and Communication in English

Unit 1

Communication: Language and communication, differences between speech and writing, distinct features of speech, distinct features of writing.

Unit 2

Writing Skills; Selection of topic, thesis statement, developing the thesis; introductory, developmental, transitional and concluding paragraphs, linguistic unity, coherence and cohesion, descriptive, narrative, expository and argumentative writing.

Unit 3

Technical Writing: Scientific and technical subjects; formal and informal writings; formal writings/reports, handbooks, manuals, letters, memorandum, notices, agenda, minutes; common errors to be avoided.

SUGGESTED READINGS:

1. M. Frank. Writing as thinking: *A guided process approach*, Englewood Cliffs, Prentice Hall Regents.
2. L. Hamp-Lyons and B. Heasley: Study Writing; *A course in written English*. For academic and professional purposes, Cambridge Univ. Press.
3. R. Quirk, S. Greenbaum, G. Leech and J. Svartik: *A comprehensive grammar of the English language*, Longman, London.
4. Daniel G. Riordan & Steven A. Panley: “*Technical Report Writing Today*” - Biztaantra.

ADDITIONAL REFERENCE BOOKS:

5. Daniel G. Riordan, Steven E. Pauley, Biztantra: *Technical Report Writing Today*, 8th Edition (2004).
6. *Contemporary Business Communication*, Scot Ober, Biztantra, 5th Edition (2004)

Paper STH 102: Calculus-I

Differential Calculus: Limits of functions, continuous functions (ϵ and δ notations), properties of continuous functions, review of results on differentiation, Successive differentiation, Leibnitz rule, partial differentiation, Euler's theorem on homogeneous functions; maxima and minima of functions of one and two variables, Constrained Optimisation techniques (with and without Lagrange multiplier) along with few problems. Jacobians, point of inflexion; asymptotes; concavity and convexity of functions, singular points, tracing of curves in Cartesian and polar forms.

Review of Differential Equations, equations reducible to linear forms and homogenous forms, exact differential equations, Integrating Factor, Equations of first order but not of the first degree, Equations solvable for p, y and x , Clairut's Equation. Linear differential equations with constant coefficients, Operators, solution of n th order differential equation, Inverse operators, homogeneous linear equations, equations reducible to homogeneous form

SUGGESTED READINGS:

1. Anton, H., Biven, I., Davis, S.(2002) : Calculus, J. Wiley & Sons.
2. Apostol, Tom. M. (2002): *Calculus, Vol. I*. John Wiley & Sons.
3. Ross, S.L. (1984): Differential Equations, John Wiley and Sons (Student Edition).
4. Shanti Narain (2009): Differential Calculus. (Reprint). S. Chand and Co.
5. Simmons, G. F. (1972): Differential Equations, Tata McGraw Hill.

Paper STH 103: Algebra-I

Demoivre's theorem (both integral and rational index). Expansion for $\cos n\theta$, $\sin n\theta$, $\tan n\theta$ in terms of powers of $\sin\theta$, $\cos\theta$ and $\tan\theta$. Expansion of $\sin^n\theta$, $\cos^n\theta$ in terms of sine and cosine of multiples of θ . Expansion of $\tan(\theta_1 + \dots + \theta_n)$ in terms of elementary symmetric functions of $\tan\theta_1, \dots, \tan\theta_n$. Summation of series and complex roots of unity.

Theory of equations, statement of the fundamental theorem of algebra and its consequences. Relation between roots and coefficients or any polynomial equations. Solutions of cubic and biquadratic equations when some conditions on roots of equations are given. Evaluation of the symmetric polynomials and roots of cubic and biquadratic equations.

Inequalities: Inequality of means, Holder's inequality, Cauchy-Schwartz Inequality, Triangle inequality, Tchebychef inequality, Weierstrass Inequality.

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.

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, Circulant determinants and Vandermonde determinants for nth order, Jacobi's Theorem, product of determinants. Use of determinants in solution to the system of linear equations.

SUGGESTED READINGS:

1. Beachy, J. A and. Blair, W. D (1990): Abstract Algebra with a concrete introduction, Prentice Hall
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. Hall, H.S. and. Knight, S. R. (1994) : Higher Algebra, H.M. Publications.
5. Lay, David C. (2007): Linear Algebra and its Applications (3rd Edition), Pearson Education Asia, Indian Reprint.
6. Singhal, M.K. and Singhal, A.R.(1980) : Algebra, 10th edition. R. Chand & Co.

Paper STH 104: Probability and Statistical Methods-I

Statistical Methods: Concepts of statistical population and sample from a population, quantitative and qualitative data, Nominal, ordinal and time series data, discrete and continuous data. Presentation of data by table and by diagrams, frequency distributions by histogram and frequency polygon, cumulative frequency distributions (inclusive and exclusive methods) and ogive. Bivariate data-scatter diagram, principle of least squares and fitting of polynomials and exponential curves.

Measures of location (or central tendency) and dispersion. moments, measures of skewness and kurtosis, absolute moments and factorial moments, Inequalities concerning moments, Sheppard's corrections. Theory of attributes: Consistency of data, conditions for consistency, independence and association of attributes, measures of association and contingency.

Probability Theory: Random experiments, sample point and sample space, event, algebra of events. Definition of Probability – classical and relative frequency approach to probability; Richard Von-Mises, and Kolmogorov's approach to probability, merits and demerits of these approaches (only general ideas to be given), theorems on probability, conditional probability, independent events, Bayes theorem and its applications.

SUGGESTED READINGS:

1. Goon A.M., Gupta M.K. and Dasgupta B. (2005): Fundamentals of Statistics, Vol. I, 8th Edn. World Press, Kolkata.
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 Edn., (Reprint), Sultan Chand and Sons.
4. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
5. 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.
6. Rohatgi, V. K. and Saleh, A. K. Md. E. (2009): An Introduction to Probability and Statistics, 2nd Edn. (Reprint). John Wiley and Sons.

STATISTICS/ COMPUTER LAB.:

Practical-I:

comprising the following two parts:

Part A: Based on Papers STH 103 and STH 104

Part B: Introduction to Computer fundamentals and Electronic Spread sheet.

Semester II: Examination 2012 and onwards

Paper STH 201: Calculus-II

Review of integration and definite integrals, integration of irrational functions. Reduction formulae, application of integration: Rectification and quadrature, volumes and surfaces of revolution for cartesian and polar curves, differentiation under integral sign.

Double Integrals, change of order of integration, transformation of variables, Beta and Gamma integrals and relationship between them.

Geometry: Pair of straight lines, Circle, derivation of equation of tangent, normal, polar and length of tangent from any external point. Conic sections: Equation of Parabola and associated theorems, Ellipse, eccentric angle, equation of Ellipse and its tangents and normal in terms of eccentric angle, Hyperbola in standard forms and their properties, real, conjugate and rectangular Hyperbola.

SUGGESTED READINGS:

1. Gorakh Prasad and Gupta, H. C. (1994): Text Book on Coordinate Geometry, Pothishala 'Pvt. Ltd., Allahabad.
2. Shanti Narain and Mittal, P.K. (2007): Integral Calculus. (Reprint). S. Chand and Co.
3. Strauss, M. J., Bradley, G. L. and Smith, K. J. (2007): *Calculus* (3rd Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Paper STH 202: Algebra-II

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. Rank of a matrix, row-rank, column-rank, standard theorems on ranks, rank of the sum and the product of two matrices. Generalized inverse (concept with illustrations). Partitioning of matrices and simple properties. Homogeneous and non-homogeneous system of linear equations- their consistency and general solutions. Introduction to matrix polynomial. Characteristic roots and characteristic vectors of a matrix, Cayley-Hamilton theorem. Quadratic forms, linear orthogonal transformation and their diagonalisation.

Sets ,binary relations. Definitions and examples of groups,abelian-groups, rings, integral domain, skew-field and fields ,vector spaces with illustrations, vector space with real scalars, linear combination of vectors, sub-spaces, linear span, bases and change of bases, dimensions, orthogonal vectors, orthogonal basis, Gram-Schmidt orthogonalisation process. Matrix differentiation.

SUGGESTED READINGS:

1. Artin, M. (1994): Algebra. Prentice Hall of India.
2. Datta, K.B. (2002) : Matrix and Linear Algebra. Prentice Hall of India Pvt. Ltd.
3. Graybill, F.E.(1961) :Introduction to Matrices with Applications in Statistics. Wadsworth Pub. Co.
4. Gupta, S.C. (2008): An Introduction to Matrices. (Reprint). Sultan Chand & Sons.
5. Hadley, G. (2002) : Linear Algebra. Narosa Publishing House Reprint.
6. Searle, S. R. (1982) : Matrix Algebra Useful for Statistics. John Wiley & Sons.

Paper STH 203: Probability and Statistical Methods-II

Random Variables: Discrete and continuous random variables, p.m.f. , p.d.f. , c.d.f. illustrations of random variables and its properties. Univariate transformations.

Expectation of random variable and its properties. Moments and cumulants, moment generating function. Cumulant generation function and characteristic function.

Standard discrete probability distributions: Degenerate, Binomial, Poisson, Geometric, Negative Binomial, Hypergeometric.

Standard continuous probability distributions: Normal, uniform, exponential, beta, gamma, Cauchy, Laplace.

SUGGESTED READINGS:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2003): An Outline of Statistical Theory, Vol. I, 4th Edn. World Press, Kolkata.
2. Gupta, S.C. and Kapoor, V.K. (2007): Fundamentals of Mathematical Statistics, 11th Edn., (Reprint), Sultan Chand and Sons.
3. Hogg, R.V. and Tanis, E.A. (2009): A Brief Course in Mathematical Statistics. Pearson Education.
4. Johnson, N.L., Kotz, S. and Balakrishnan, N. (1994): Discrete Univariate Distributions, John Wiley.
5. Johnson, N.L., Kotz, S. and Balakrishnan, N. (1994): Continuous Univariate Distributions, Vol. I & Vol. II, 2nd Edn., John Wiley.

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, 2nd Edn. (Reprint). John Wiley and Sons.
8. Ross, S. M. (2007): Introduction to Probability Models, 9th Edn., Indian Reprint, Academic Press.

Paper STH 204: Applied Statistics-I

Index Numbers: Definition, construction of index numbers by different methods, Problems faced in their construction, criterion of a good index number-Test Theory-unit, time reversal, factor reversal and circular tests. Errors in the construction of index numbers. Chain and Fixed base index numbers. Base Shifting, Splicing and Deflating of index numbers. Cost of Living Index numbers- construction and uses. Wholesale Price Index and Index of Industrial Production.

Demand Analysis: Demand function, price and income elasticity of demand, nature of commodities, laws of supply and demand, Income distributions, Pareto – curves of concentration.

Utility and Production Functions: utility function, constrained utility maximisation, indifference curves, derivation of demand curve, production function, homogeneous production functions, Isoquant and Isocost curves, Elasticity of substitution, C.E.S. functions, Multiple production by monopolist, discriminating monopolistic form, multiplant form.

Application of integration in Economics: Given Elasticity of any function then how to find function, consumer surplus, producer surplus, learning curves, finding consumption function from M.P.C, finding profit function from M.R and M.C.

Mathematical Finance: Compound Interest, Discount and present value, Different types of annuities.

SUGGESTED READINGS:

1. Allen, R.G.D. (1975): Index Numbers in Theory and Practice. Macmillan.
2. Allen, R.G.D. (1995): Mathematical Analysis for Economist. Macmillan.
3. Ayer, Frank. (1983): Theory and Problems of Mathematics of Finance (Schaum's Outline Series), Mc Graw Hill Book Company, Singapore
4. Croxton, F.E., Cowden, D.J. and Klein, S. (1982): Applied General Statistics, 3rd Edn. Prentice Hall of India (P) Ltd.
5. Gupta, S.C. and Kapoor, V.K. (2008): Fundamentals of Applied Statistics, 4th Edn., (Reprint), Sultan Chand and Sons.
6. Soni, R.S. (1996): Business Mathematics with Application in Business and Economics. Pitamber Publishing Co.

STATISTICS LAB.:

Practical-II:

Based on Papers STH 202, STH 203 and STH 204.