SEMESTER BASED SYLLABUS FOR THE COURSE

"B.A. Programme"

STATISTICS

DETAILED COURSES OF READINGS

SEMESTER-I

PAPER I : Basic Statistics and Probability

Concepts of a 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 tables and by diagrams, frequency distributions for discrete and continuous data, graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions (inclusive and exclusive methods). Ogives.

Measures of location (or central tendency) and dispersion, moments, measures of skewness and kurtosis, cumulants. Bivariate data: Scatter diagram, principle of least-squares and fitting of polynomials and exponential curves. 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; 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. Gupta, S.C. and Kapoor, V.K. (2007): Fundamentals of Mathematical Statistics, 11th Edn., (Reprint), Sultan Chand and Sons.
3. Hogg, R.V., Craig, A.T. and Mckean, J.W. (2005): Introduction to Mathematical Statistics, 6th Edn. Pearson Education.
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.

SEMESTER-II

PAPER II : Statistical Methods – I

Random variables: Discrete and continuous random variables, p.m.f., p.d.f. and c.d.f., illustrations of random variables and their properties, expectation of random variable and its properties. Moments and cumulants, moment generating function, cumulant generating function and characteristic

function. Transformation in univariate and bivariate distributions. Bivariate probability distributions; marginal and conditional distributions; independence of variates (only general idea to be given).

Point (or degenerate), Binomial, Poisson, Geometric, Negative Binomial, Hypergeometric, 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 applications. De Moivre's Laplace Theorem.

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., Craig, A.T. and Mckean, J.W. (2005): Introduction to Mathematical Statistics, 6th Edn., Pearson Education.
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.
5. Rohatgi, V. K. and Saleh, A. K. Md. E. (2009): An Introduction to Probability and Statistics, 2nd Edn. (Reprint). John Wiley and Sons.
6. Ross, S. M. (2007): Introduction to Probability Models, 9th Edn., Indian Reprint, Academic Press.

SEMESTER-III

PAPER III : Statistical Methods – II

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

Sampling Distributions: Definitions of random sample, parameter and statistic, sampling distribution of a statistic, standard errors of sample mean, sample proportion and sample moments, sampling distribution of sample mean and sample variance for normal distribution. Sampling distributions of Chi-square, t and F statistics.

Tests of significance: Null and alternative hypotheses, level of significance and probabilities of Type I and Type II errors, critical region and power of test. Large sample tests, use of CLT for testing single proportion and difference of two proportions, single mean and difference of two means, standard deviation and difference of standard deviations. Tests of significance based on Chi-square, t and F distributions. Simple numerical problems based on t, F, chi-square and large sample tests.

SUGGESTED READINGS:

1. Goon, A.M. Gupta, M.K. and Dasgupta, B. (2005): An Outline of Statistical Theory, Vol. II, 3rd 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. (1988): Probability and statistical inference, 3rd Edn. Macmillan Publishing Co., Inc.
4. Mukhopadhyay, P. (2000): Mathematical Statistics, 2nd Edn. Books and Allied (P) Ltd.
5. Rohatgi, V. K. and Saleh, A. K. Md. E. (2009): An Introduction to Probability and Statistics, 2nd Edn. (Reprint). John Wiley and Sons.

SEMESTER-IV

PAPER IV: Statistical Inference and Regression Analysis

Point estimation, requirement of a good estimator - consistency, unbiasedness, efficiency and sufficiency. Cramer-Rao inequality, minimum variance unbiased estimators, Statement of Rao-Blackwell theorem, method of maximum likelihood, Properties of Maximum likelihood estimators (without proof), confidence intervals (assuming normality) for means, proportions, difference of means and of proportions.

Statistical hypothesis, critical region, two kinds of errors, level of significance and power of a test, Neyman-Pearson lemma (statement only), critical regions for simple hypotheses. Sign test and run test.

Fitting a straight line in matrix terms, variance and covariance of b_o and b_1 from the matrix calculations, Bivariate and multiple linear regression. Linear models, Best linear unbiased estimator (BLUE), Gauss-Markov theorem, estimation of error variance.

SUGGESTED READINGS:

1. Casella, G. and Berger, R.L. (2002): Statistical Inference, Second Edn. Thomson Duxbury.
2. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2005): An Outline of Statistical Theory, Vol. II, 3rd 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. Rohatgi, V. K. and Saleh, A. K. Md. E. (2009): An Introduction to Probability and Statistics, 2nd Edn. (Reprint). John Wiley and Sons.
5. Kshirsagar, A.M. (1983): A Course in Linear Models, Marcel Dekker, Inc., N.Y.
6. Montgomery, D. C., Peck, E.A. and Vinning, G.G. (2006): Introduction to Linear Regression Analysis, 3rd Edn. John Wiley and Sons.

SEMESTER-V

PAPER V : Applied Statistics

Time Series and its components with illustrations, additive and multiplicative models, determination of trend by method of least squares, measurement of seasonal fluctuations by ratio to trend method.

Index numbers: Criteria for a good index number. Different types of index numbers. Construction of index numbers of prices and quantities. Cost of living index number. Uses and limitations of index numbers.

Sources of demographic data, measures of fertility and mortality, standardised death rate, total fertility rate, gross reproduction rate, net reproduction rate, life tables and its main features and applications. Concept of abridged life table.

Process and product control, producer's and consumer's risks, control charts for variables and attributes - $\overline{X}$, R, s, p and c charts.

SUGGESTED READINGS:

1. Croxton F.E. and Cowden D.J. (1969): Applied General Statistics, Prentice Hall of India.
2. Goon A.M., Gupta M.K., Dasgupta B. (2005): Fundamentals of Statistics, Vol. II, 8th Edn. World Press, Kolkata.
3. Gupta, S.C. and Kapoor, V.K. (2008): Fundamentals of Applied Statistics, 4th Edn., (Reprint), Sultan Chand and Sons.
4. Montgomery, D. C. (1996): Introduction to Statistical Quality Control, John Wiley & Sons, New York.
5. Mukhopadhyay, P. (1999): Applied Statistics. Books and Allied (P) Ltd.

SEMESTER-VI

PAPER VI : Sample Surveys and Design of Experiments

Need for sampling, principal steps in the conduct of sample surveys, simple random sampling, stratified random sampling, systematic sampling, ratio and regression methods of estimation, cluster sampling.

Indian Official Statistics : Present Official Statistical System in India relating to census of population, agriculture, industrial production, and prices; methods of collection of official statistics, their reliability and limitations and the principal publications containing such statistics. Also the various agencies responsible for the data collection – C.S.O., N.S.S.O., Office of Registrar General, their historical development, main functions and important publications.

Analysis of Variance and Covariance: Analysis of variance and covariance (with one concomitant variable) in one-way and two-way classified data with equal number of observations per cell.

Design of Experiments: Principles of experimentation, uniformity trials, completely randomized, randomized block and latin square designs. Missing plot technique.

SUGGESTED READINGS:

1. Cochran, W.G. (1977): Sampling Techniques, John Wiley & Sons, New York.
2. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2005): Fundamentals of Statistics. Vol. II, 8th Edn. World Press, Kolkata.
3. Gupta, S.C. and Kapoor, V.K. (2008): Fundamentals of Applied Statistics, 4th Edn., (Reprint), Sultan Chand and Sons.
4. Montgomery, D. C. (2001): Design and Analysis of Experiments, John Wiley & Sons, New York.
5. Sukhatme, P.V., Sukhatme, B.V., Sukhatme, S. and Asok, C. (1984). Sampling Theory of Surveys with Applications, Iowa State University Press, Iowa, USA.