

The University of Burdwan

B.Sc General in Statistics

CBCS syllabus (effect from 2017-2018)

Semester- I

CC-1

Statistical Methods(Th)

4 Credits

Unit 1

(12L)

Introduction: Definition and scope of Statistics, concepts of statistical population and sample. Data: quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio. Frequency distribution, Presentation: tabular and graphic, including histogram and ogives.

Unit 2

(10L)

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

Unit 3

(10L)

Bivariate data: Definition, scatter diagram, simple, partial and multiple correlation (3 variables only), rank correlation (Spearman). Simple linear regression, principle of least squares and fitting of polynomials and exponential curves.

Unit 4

(8L)

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

Reference Books

- Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8th Edn. The World Press, Kolkata.
- Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
- 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.
- Goon A.M., Gupta M.K. and Dasgupta B. : Basic Statistics. The World Press, Kolkata.
- Chakraborty, Arnab (2016) : Probability and Statistics. Sarat Book House.

Statistical Methods Lab (Prac)

2 Credits

List of Practical

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.

Semester- II

CC-2

Introductory Probability (Th)

4 Credits

Unit 1

(12L)

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.

Unit 2

(8L)

Random Variables: Discrete and continuous random variables, p.m.f., p.d.f., c.d.f. Illustrations of random variables and its properties. Expectation, variance, moments and moment generating function.

Unit 3

(10L)

Convergence in probability, almost sure convergence, Chebyshev's inequality, weak law of large numbers, De-Moivre Laplace and Lindeberg-Levy Central Limit Theorem (C.L.T).

Unit 4

(10L)

Standard probability distributions: Binomial, Poisson, geometric, negative binomial, hypergeometric, uniform, normal, exponential, beta, gamma.

Reference Books

- Hogg, R.V., Tanis, E.A. and Rao J.M. (2009): Probability and Statistical Inference, Seventh Ed, Pearson Education, New Delhi.
- Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
- Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New Delhi
- Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8th Edn. The World Press, Kolkata.
- Chakraborty, Arnab (2016): Probability and Statistics. Sarat Book House.
- Ross, S. (2002): A First Course in Probability, Prentice Hall.

Introductory Probability Lab (Prac)

2 Credits

List of Practical

1. Fitting of binomial distributions for n and $p = q = \frac{1}{2}$ given
2. Fitting of binomial distributions for n and p given
3. Fitting of binomial distributions computing mean and variance
4. Fitting of Poisson distributions for given value of λ
5. Fitting of Poisson distributions after computing mean
6. Application problems based on binomial distribution
7. Application problems based on Poisson distribution

8. Problems based on area property of normal distribution
9. To find the ordinate for a given area for normal distribution
10. Application based problems using normal distribution
11. Fitting of normal distribution when parameters are given
12. Fitting of normal distribution when parameters are not given

Semester- III

CC-3

Basics of Statistical Inference (Th)

4 Credits

Unit 1

(12L)

1. Population and Sample, Parameter and Statistic, Population distribution and Sampling distribution.
2. Statistical Inference: Point Estimation, Interval Estimation and Testing of Statistical Hypothesis.
3. Four useful distributions for statistical Inference; Normal, χ^2 , t and F (Statement of the pdf's & shape of the curves)
4. Estimation of population mean, confidence intervals for the parameters of a normal distribution (one sample and two sample problems). The basic idea of significance test. Null and alternative hypothesis. Type I & Type II errors, level of significance, concept of p-value. Tests of hypotheses for the parameters of a normal distribution (one sample and two sample problems).

Unit 2

(10L)

Categorical data: Tests of proportions, tests of association and goodness-of-fit using Chi-square test.

Unit 3

(10L)

Tests for the significance of correlation coefficient. Sign test. Wilcoxon two-sample test.

Unit 4

(8L)

Analysis of variance, one-way and two-way classification.

Reference Books

- ▶ Daniel, Wayne W., Bio-statistics (2005): A Foundation for Analysis in the Health Sciences. John Wiley .
- ▶ Goon, A.M., Gupta M.K. & Das Gupta(2005):Fundamentals of statistics, Vol.-I & II.
- ▶ Dass, M. N. &Giri, N. C.: Design and analysis of experiments. John Wiley.
- ▶ Dunn, O.J (1977): Basic Statistics: A primer for the Biomedical Sciences. John Wiley
- ▶ Bancroft, Holdon Introduction to Bio-Statistics (1962) P.B. Hoebar New York
- ▶ Goldstein, a Biostatistics-An introductory text (1971). The Macmillan New York

Basics of Statistical Inference Lab (Prac)

2 Credits

List of Practical

1. Estimators of population mean.
2. Confidence interval for the parameters of a normal distribution (one sample and two sample problems).
3. Tests of hypotheses for the parameters of a normal distribution (one sample and two sample problems).
4. Chi-square test of proportions.
5. Chi-square tests of association.

6. Chi-square test of goodness-of-fit.
7. Test for correlation coefficient.
8. Sign test for median.
9. Sign test for symmetry.
10. Wilcoxon two-sample test.
11. Analysis of Variance of a one way classified data
12. Analysis of Variance of a two way classified data.
13. Analysis of a CRD.
14. Analysis of an RBD.

Skill Enhancement Course

(For the students of Statistics Subject/ Discipline)

SEC-1

Numerical Analysis (Th)

2 Credits

Unit 1

(5L)

1. Approximation of numbers and functions,
2. Absolute and Relative errors.

Unit 2

(5L)

Interpolation : Polynomial approximation, Difference Table, Newton's Forward and Backward interpolation formulae and Lagrange's general interpolation formula, Error terms.

Unit 3

(5L)

Numerical differentiation and its applications.

Unit 4

(5L)

Numerical Integration : Trapezoidal and Simpson's 1/3 rules.

Numerical solution of equations : method of false position, method of fixed point iteration and Newton-Raphson method in one unknown, Conditions of convergence, rates of convergence.

Reference Books

- Scarborough J.B. (1958) : Numerical Mathematical Analysis, Oxford Univ. Press
- Atkinson K. (1985) : Elementary Numerical Analysis
- Sastry S.S. (1998) : Introductory Methods of Numerical Analysis
- Hildebrand F.B. (1974) : Introduction to Numerical Analysis, Tata McGraw-Hill

Semester- IV

CC-4

Applied Statistics (Th)

4 Credits

Unit 1

(10L)

Economic Time Series: Components of time series, Decomposition of time series- Additive and multiplicative model with their merits and demerits, Illustrations of time series. Measurement of trend by method of free-hand curve, method of semi-averages and method of least squares (linear, quadratic and modified exponential). Measurement of seasonal variations by method of ratio to trend.

Unit 2

(10L)

1. Index numbers: Definition, Criteria for a good index number, different types of index numbers. Construction of index numbers of prices and quantities, consumer price index number & wholesale price index number. Index of Industrial Production and rate of inflation. Uses and limitations of index numbers.

2. Measures of Inequality and Development: Gini's coefficient and Lorenz curve, Human Development Index.

Unit 3

(10L)

Statistical Quality Control: Importance of statistical methods in industrial research and practice. Determination of tolerance limits. Causes of variations in quality: chance and assignable. General theory of control charts, process & product control, Control charts for variables: X-bar and R- charts. Control charts for attributes: p and c-charts.

Unit 4

(10L)

1. Demographic Methods: Introduction, measurement of population, rates and ratios of vital events. Measurement of mortality: CDR, SDR (w.r.t. Age and sex), IMR, Standardized death rates.

2. Life (mortality) tables: definition of its main functions and uses. Measurement of fertility and reproduction: CBR, GFR, and TFR. Measurement of population growth: GRR, NRR.

Reference Books

- ▶ Mukhopadhyay, P. (1999): Applied Statistics, New Central Book Agency, Calcutta.
- ▶ Goon, A.M., Gupta, M.K. and Dasgupta, B. (2008): Fundamentals of Statistics, Vol. II, 9th Edition World Press, Kolkata.
- ▶ Gupta, S. C. and Kapoor, V.K. (2008): Fundamentals Of Applied Statistics, 4th Edition (Reprint), Sultan Chand & Sons
- ▶ Montgomery, D. C. (2009): Introduction to Statistical Quality Control, 6th Edition Wiley India Pvt. Ltd.

Applied Statistics Lab (Prac)

2 Credits

List of Practical

1. Measurement of trend: Fitting of linear, quadratic trend, exponential curve and plotting of trend values and comparing with given data graphically.
2. Measurement of seasonal indices by Ratio-to-trend method and plotting of trend values and comparing with given data graphically.

3. Construction of price and quantity index numbers by Laspeyre's formula, Paasche's formula, Marshall-Edgeworth's formula, Fisher's Formula. Comparison and interpretation.
4. Construction of Consumer and wholesale price index numbers, fixed base index number and consumer price index number with interpretation.
5. Gini's coefficient, Lorenz curve, Human Development Index.
6. Construction and interpretation of X bar & R-chart.
7. Construction and interpretation p-chart (fixed sample size) and c-chart.
8. Computation of measures of mortality.
9. Completion of life table.
10. Computation of measures of fertility and population growth.

Skill Enhancement Course

(For the students of Statistics Subject/ Discipline)

SEC-2

Research Methodology

(Th)

2 Credits

Unit 1

(5L)

What is Research? Role of Research in important areas. Characteristics of Scientific Method. Process of research: Stating Hypothesis or Research question, Concepts & Constructs, Units of analysis & characteristics of interest, Independent and Dependent variables, Extraneous or Confounding variables. Measurements and scales of Measurements. Types of research: Qualitative & Quantitative Research, Longitudinal Research, Survey & Experimental Research.

Unit 2

(5L)

Survey Methodology and Data Collection, sampling frames and coverage error, non-response.

Unit 3

(5L)

Review of various techniques for data analysis covered in core statistics papers, techniques of interpretation, precaution in interpretation.

Unit 4

(5L)

Develop a questionnaire, collect survey data pertaining to a research problem (such as gender discriminations in private v/s government sector, unemployment rates, removal of subsidy, impact on service class v/s unorganized sectors), questions and answers in surveys, Internal & External validity, interpret the results and draw inferences. Formats and presentations of Reports – an overview.

Reference Books

- ▶ Kothari, C.R. (2009): Research Methodology: Methods and Techniques, 2nd Revised Edition reprint, New Age International Publishers.
- ▶ Kumar, R (2011): Research Methodology: A Step - by - Step Guide for Beginners, SAGE publications.

Semester- V

Discipline Specific Elective

(For the students of Statistics Subject/ Discipline)

DSE-1

Probability and Probability Distributions –II (Th)

4 Credits

Unit 1

(10L)

Continuous random variables, p.d.f. and c.d.f., illustrations and properties, univariate transformations with illustrations. Two dimensional random variables: continuous type, joint, marginal and conditional, p.d.f., and c.d.f.. Independence of two variables.

Unit 2

(12L)

Mathematical Expectation (discrete and continuous): Single & bivariate random variables and their properties. Probability generating function. Moments. Moment generating function. Correlation coefficient, Conditional expectation and variance.

Probability Inequalities: Markov & Chebyshev.

Unit 3

(10L)

Standard continuous probability distributions: uniform, normal, exponential, Cauchy, beta, gamma, lognormal, logistic, double exponential and Pareto along with their properties and limiting/approximation cases.

Unit 4

(8L)

Bivariate Normal Distribution (BVN): p.d.f. of BVN, properties of BVN, marginal and conditional p.d.f. of BVN.

Reference Books

- Hogg, R.V., Tanis, E.A. and Rao J.M. (2009): Probability and Statistical Inference, Sevent Ed, Pearson Education, New Delhi.
- Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
- Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New Delhi.

Probability and Probability Distributions -II Lab (Prac)

2 Credits

List of Practical

1. Problems based on area property of normal distribution.
2. To find the ordinate for a given area for normal distribution.
3. Application based problems using normal distribution.
4. Fitting of normal distribution when parameters are given.

5. Fitting of normal distribution when parameters are not given.
6. Problems similar to those in 1 to 5 in cases of other continuous distributions.

Or

Time Series Analysis (Th)

4 credits

Unit 1

(12L)

1. Introduction to time series data, application of time series from various fields.
2. Modelling time series as deterministic function plus IID errors:
3. Components of a time series (trend, cyclical and seasonal patterns, random error) Decomposition of time series.
4. Estimation of trend: free hand curve method, method of moving averages, fitting various mathematical curves and growth curves.

Unit 2

(10L)

1. Effect of elimination of trend on other components of the time series.
2. Estimation of seasonal component by Method of simple averages,
3. Notions of multiplicative models: ratio to Trend.

Unit 3

(10L)

1. Introduction to stochastic modelling: Concept of stationarity. Illustration of how a stationary time series may show temporal patterns. Stationarity in mean.
2. Box-Jenkins modelling: Moving-average (MA) process and Autoregressive (AR) process of orders one and two. ACF, PACF and their graphical use in guessing the order of AR and MA processes. Estimation of the parameters of AR (1) and AR (2) using Yule-Walker equations.

Unit 4

(8L)

Forecasting: Exponential smoothing methods, Short term forecasting methods: Brown's discounted regression,

Reference Books

- ▶ Chatfield C. (1980): The Analysis of Time Series –An Introduction, Chapman & Hall.
- ▶ Kendall M.G. (1976): Time Series, Charles Griffin.
- ▶ Brockwell and Davis (2010): Introduction to Time Series and Forecasting (Springer Texts in Statistics), 2nd Edition.

Time Series Analysis Lab (Prac)

2 Credits

List of Practical

1. Plotting a real life time series, and detecting various features (trend, periodic behaviours etc). Suggested data sets:
 - a. Sun spot data, b. Dollar-Rupee exchange rates and c. Stock market data
2. Fitting and plotting of mathematical curves:

- a. modified exponential curve b. Gompertz curve
3. Fitting of trend by Moving Average Method
4. Plotting detrended series.
5. Measurement of Seasonal indices Ratio-to-Moving Average method
6. Plotting ACF and PACF of a given time series
7. Using Yule-Walker equation to fit AR (1) and AR (2) models to real life data.
8. Forecasting by short term forecasting methods.
9. Forecasting by exponential smoothing

Skill Enhancement Course

(For the students of Statistics Subject/ Discipline)

SEC-3

Monte Carlo Method (Th)

2 Credits

Unit 1

(5L)

1. Using the computer for random number generation. (treated as a black box)
2. A brief look at some popular approaches (non mathematical justification needed).
3. Simulating a coin toss, a die roll and a card shuffle.

Unit 2

(5L)

1. CDF inversion method. Simulation from standard distributions.
2. Finding probabilities and moments using simulation.

Unit 3

(5L)

Monte Carlo integration. Basic idea of importance sampling. MCMC not included.

Unit 4

(5L)

1. Generating from Binomial and Poisson distributions, and comparing the histograms to the PMFs.
2. Generating from Uniform (0,1) distribution, and applying inverse CDF transforms.
3. Simulating Gaussian distribution using Box-Muller method.
4. Approximating the expectation of a given function of a random variable using simulation.
5. Graphical demonstration of the Law of Large Numbers.
6. Approximating the value of pi by simulating dart throwing.

Reference Books

- ▶ Shonkwiler, Ronald W. and Mendivil, Franklin (2009): Explorations in Monte Carlo Methods(Undergraduate Texts in Mathematics)
- ▶ Carsey, Thomas M. and Harden, Jeffrey J. (2014): Monte Carlo Simulation and Resampling Methods for Social Science.

Or

Statistical Data Analysis Using R(Th)

2 Credits

Unit 1

(5L)

1. Introduction to R: Installation, command line environment, overview of capabilities, brief mention of open source philosophy.
2. R as a calculator: The four basic arithmetic operations. Use of parentheses nesting up to arbitrary level. The power operation. Evaluation of simple expressions. Quotient and remainder operations for integers.
3. Standard functions, e.g., sin, cos, exp, log.

Unit 2

(5L)

1. The different types of numbers in R: Division by zero leading to Inf or -Inf. NaN. NA. No need to go into details.
2. Variables. Creating a vector using `c()`, `seq()` and colon operator. How functions map over vectors.
3. Functions to summarise a vector: `sum`, `mean`, `sd`, `median` etc. Extracting a subset from the vector (by index, by property).
4. R as a graphing calculator: Introduction to plotting. `Plot()`, `lines()`, `abline()`. No details about the graphics parameters except colour and line width. Barplot, Pie chart and Histogram. Box plot. Scatter plot and simple linear regression using `lm(y~x)`.

Unit 3

(5L)

1. Matrix operations in R: Creation. Basic operations. Extracting submatrices.
2. Loading data from a file: `read.table()` and `read.csv()`. Mention of `head=TRUE` and `head=FALSE`. Dataframes. Mention that these are like matrices, except that different columns may be of different types.

Unit 4

(5L)

Problems on discrete and continuous probability distributions.

Reference Books

► Gardener, M (2012) *Beginning R: The Statistical Programming Language*, Wiley Publications.

► Braun W J, Murdoch D J (2007): *A First Course in Statistical Programming with R*. Cambridge University Press. New York

► A simple introduction to R by Arnab Chakraborty (freely available at <http://www.isical.ac.in/~arnabc/>)

► R for beginners by Emmanuel Paradis (freely available at ftp://cran.r-project.org/pub/R/doc/contrib/Paradis-rdebuts_en.pdf)

Semester- VI

Discipline Specific Elective

(For the students of Statistics Subject/ Discipline)

DSE-2

Survey Sampling and Indian Official Statistics (Th)

4 credits

Unit 1

(12L)

1. Concept of population and sample, complete enumeration versus sampling, sampling and non-sampling errors.
2. Types of sampling: non-probability and probability sampling, basic principle of sample survey, simple random sampling with and without replacement, definition and procedure of selecting a sample,
3. Estimates of: population mean, total and proportion, variances of these estimates, estimates of their variances and sample size determination.

Unit 2

(8L)

1. Stratified random sampling: Technique, estimates of population mean and total, variances of these estimates, proportional and optimum allocations and their comparison with SRS. Practical difficulties in allocation, estimation of gain in precision, post stratification and its performance.
2. Systematic Sampling: Technique, estimates of population mean and total, variances of these estimates ($N=n \times k$). Comparison of systematic sampling with SRS and stratified sampling in the presence of linear trend and corrections.

Unit 3

(8L)

Introduction to Ratio and regression methods of estimation, first approximation to the population mean and total (for SRS of large size), MSE of these estimates and estimates of these variances, MSE in terms of correlation coefficient for regression method of estimation and their comparison with SRS. Cluster sampling (equal clusters only) estimation of population mean and its variance, comparison (with and without randomly formed clusters). Concept of sub sampling. Two-stage Sampling, Estimation of Population mean and variance of the estimate.

Unit 4

(12L)

1. An outline of present official statistical system in India, Methods of collection of official statistics, their reliability and limitations. Role of Ministry of Statistics & Program Implementation (MoSPI), Central Statistical Office (CSO), National Sample Survey Office (NSSO), Registered General Office and National Statistical Commission. Government of India's Principal publications containing data on the topics such as Agriculture, price, population, industry, finance and employment.
2. Consumer price Index, Wholesale price index number and index of industrial production.
3. National Income: Basic idea and a brief description of income, expenditure and production approaches.

Reference Books

- Cochran, W.G. (1984): Sampling Techniques (3rd Ed.), Wiley Eastern.

- ▶ Sukhatme, P.V., Sukhatme, B.V. Sukhatme, S. Asok, C. (1984). Sampling Theories of Survey With Application, IOWA State University Press and Indian Society of Agricultural Statistics
- ▶ Murthy, M.N. (1977): Sampling Theory & Statistical Methods, Statistical Pub. Society, Calcutta.
- ▶ Des Raj and Chandhok P. (1998): Sample Survey Theory, Narosa Publishing House.
- ▶ Goon A.M., Gupta M.K. and Dasgupta B. (2008): Fundamentals of Statistics (Vol.2), WorldPress.
- ▶ Guide to current Indian Official Statistics, Central Statistical Office, GOI, and New Delhi.
- ▶ <http://mospi.nic.in/>

Survey Sampling and Indian Official Statistics Lab (Prac)

2 credits

List of Practical

1. To select a SRS with and without replacement.
2. For a population of size 5, estimate population mean, population mean square and population variance. Enumerate all possible samples of size 2 by WR and WOR and establish all properties relative to SRS.
3. For SRSWOR, estimate mean, standard error, the sample size.
4. Stratified Sampling: allocation of sample to strata by proportional and Neyman's methods. Compare the efficiencies of above two methods relative to SRS.
5. Estimation of gain in precision in stratified sampling.
6. Comparison of systematic sampling with stratified sampling and SRS in the presence of a linear trend.
7. Ratio and Regression estimation: Calculate the population mean or total of the population. Calculate mean squares. Compare the efficiencies of ratio and regression estimators relative to SRS.
8. Cluster sampling: estimation of mean or total, variance of the estimate.
9. Two-stage Sampling.
10. Tabular and graphical exercises based on available official statistics.
11. Construction of Consumer and wholesale price index numbers.

Or

Demography and Vital Statistics (Th)

4 Credits

Unit 1

(12L)

Population Theories: Coverage and content errors in demographic data, use of balancing equations and Chandrasekaran-Deming formula to check completeness of registration data. Adjustment of age data, use of Myer and UN indices, Population composition, dependency ratio.

Unit 2

(12L)

Introduction and sources of collecting data on vital statistics, errors in census and registration data. Measurement of population, rate and ratio of vital events. Measurements of Mortality: Crude Death Rate (CDR), Specific Death Rate (SDR), Infant Mortality, Rate (IMR) and Standardized Death Rates.

Unit 3

(8L)

Stationary and Stable population, Central Mortality Rates and Force of Mortality. Life (Mortality) Tables: Assumption, description, construction of Life Tables and Uses of Life Tables. Measurements of Fertility: Crude Birth Rate (CBR), General Fertility Rate (GFR), Specific Fertility Rate (SFR) and Total Fertility Rate (TFR).

Unit 4

(8L)

Measurement of Population Growth: Crude rates of natural increase, Pearl's Vital Index, Gross

Reproduction Rate (GRR) and Net Reproduction Rate (NRR). Population Estimation, Projection and Forecasting: Use of A.P. and G.P. methods for population estimates,

Fitting of Logistic curve for population forecasting using Rhode's method.

Reference Books

- ▶ Mukhopadhyay, P. (1999): Applied Statistics, Books and Allied (P) Ltd.
- ▶ Goon, A.M., Gupta, M.K. and Dasgupta, B. (2008): Fundamentals of Statistics, Vol. II, 9th Edition, World Press.
- ▶ Biswas, S. (1988): Stochastic Processes in Demography & Application, Wiley Eastern Ltd.
- ▶ Keyfitz, N and Caswell. H (2005): Applied Mathematical Demography (3rd edition), Springer.
- ▶ Chattopadhyay, A.K. and Saha, A.K. (2012): Demography: Techniques and Analysis, Viva Books.
- ▶ Ramakuar, R. and Gopal, Y.S. (1986): Technical Demography. Wiley Eastern Ltd.

Demography and Vital Statistics Lab (Prac)**2 Credits****List of Practical**

1. To calculate CDR and Age Specific death rate for a given set of data
2. To find Standardized death rate by:- a. Direct method b. Indirect method
3. To construct a complete life table
4. To fill in the missing entries in a life table
5. To calculate CBR, GFR, SFR, TFR for a given set of data
6. To calculate Crude rate of Natural Increase and Pearl's Vital Index for a given set of data
7. Calculate GRR and NRR for a given set of data and compare them
8. Population Estimation.

Skill Enhancement Course
(For the students of Statistics Subject/ Discipline)

SEC-4

Design of Experiment

2 Credits

Unit 1

(10L)

Experimental designs: Role, historical perspective, terminology: Treatments, Experimental units & Blocks, Experimental error, Basic principles of Design of Experiments (Fisher).

Uniformity trials, fertility contour maps, choice of size and shape of plots and blocks in Agricultural experiments. Uses in Industrial Experiments.

Unit 2

(10L)

Basic designs: Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD) – layout, model and statistical analysis, relative efficiency. Analysis with one missing observation in RBD and LSD.

Or

Data Base Management Systems (Th)

2 credits

Unit 1

(5L)

Introduction: Overview of Database Management System, Introduction to Database Languages, advantages of DBMS over file processing systems.

Unit 2

(5L)

Relational Database Management System: The Relational Model, Introduction to SQL: Basic Data Types, Working with relations of RDBMS: Creating relations e.g. Bank, College Database (create table statement).

Unit 3

(4L)

Modifying relations (alter table statement), Integrity constraints over the relation like Primary Key, Foreign key, NOT NULL to the tables, advantages and disadvantages of relational Database System.

Unit 4

(6L)

Database Structure: Introduction, Levels of abstraction in DBMS, View of data, Role of Database users and administrators, Database Structure: DDL, DML, Data Manager (Database Control System). Types of Data Models Hierarchical databases, Network databases, Relational databases, Object oriented databases.

Reference Books

- ▶ Gruber, M (1990): Understanding SQL, BPB publication.
- ▶ Silberschatz, A, Korth, H and Sudarshan, S (2011) “Database System and Concepts”, 6th Edition McGraw-Hill.
- ▶ Desai, B. (1991): Introduction to Database Management system, Galgotia Publications.