

Objective

This course is meant for exposing the students in the usage of various statistical packages for analysis of data. It would provide the students an hands on experience in the analysis of their research data. This course is useful to all disciplines.

Theory

UNIT I

Use of Software packages for: Summarization and tabulation of data; Descriptive statistics; Graphical representation of data, Exploratory data analysis.

UNIT II

Fitting and testing the goodness of fit of discrete and continuous probability distributions; Testing of hypothesis based on large sample test statistics; Testing of hypothesis using chi-square, t and F statistics.

UNIT III

Concept of analysis of variance and covariance of data for single factor, multi-factor, one-way and multi-classified experiments, contrast analysis, multiple comparisons, Analyzing crossed and nested classified designs.

UNIT IV

Analysis of mixed models; Estimation of variance components; Testing the significance of contrasts; Correlation and regression including multiple regression.

UNIT V

Discriminant function; Factor analysis; Principal component analysis; Analysis of time series data, Fitting of non-linear models; Time series data; Spatial analysis; Neural networks.

Practical

Use of software packages for summarization and tabulation of data, obtaining descriptive statistics, graphical representation of data. Robust Estimation, Testing linearity and normality assumption, Estimation of trimmed means etc., Cross tabulation of data including its statistics, cell display and table format and means for different sub-classifications; Fitting and testing the goodness of fit of probability distributions; Testing the hypothesis for one sample t -test, two sample t -test, paired t -test, test for large samples - Chi-squares test, F test, One way analysis of variance, contrast and its testing, pairwise comparisons; Multiway classified analysis of variance - cross-classification, nested classification, factorial set up, fixed effect models, random effect models, mixed effect models, estimation of variance components; Generalized linear models - analysis of unbalanced data sets, testing and significance of contrasts, Estimation of variance components in unbalanced data sets - maximum likelihood, ANOVA, REML, MINQUE; Bivariate and partial correlation, Distances - to obtain a distance matrix, dissimilarity measures, similarity measures; Linear regression, Multiple regression, Regression plots, Variable selection, Regression statistics, Fitting of growth models - curve estimation models, examination of residuals; Discriminant analysis - fitting of discriminant functions, identification of important variables, Factor analysis. Principal component analysis - obtaining principal component, spectral composition; Analysis of time series data - fitting of ARIMA models, working out moving averages. Spatial analysis; Neural networks.

Suggested Readings

Anderson CW & Loynes RM. 1987. *The Teaching of Practical Statistics* . John Wiley.
Atkinson AC. 1985. *Plots Transformations and Regression* . Oxford University Press.
Chambers JM, Cleveland WS, Kleiner B & Tukey PA. 1983. *Graphical Methods for Data Analysis* . Wadsworth, Belmont, California.

Chatfield C & Collins AJ. 1980. *Introduction to Multivariate Analysis* . Chapman & Hall.

Chatfield C. 1983. *Statistics for Technology* . 3rd Ed. Chapman & Hall.

Chatfield C. 1995. *Problem Solving: A Statistician's Guide* . Chapman & Hall.

Cleveland WS. 1985. *The Elements of Graphing Data* . Wadsworth, Belmont, California.

Ehrenberg ASC. 1982. *A Primer in Data Reduction* . John Wiley.

Erickson BH & Nosanchuk TA. 1992. *Understanding Data* . 2nd Ed. Open University Press, Milton Keynes.

Snell EJ & Simpson HR. 1991. *Applied Statistics: A Handbook of GENSTAT Analyses* . Chapman & Hall.

Sprent P. 1993. *Applied Non-parametric Statistical Methods* . 2nd Ed. Chapman & Hall.

Tufte ER. 1983. *The Visual Display of Quantitative Information* . Graphics Press, Cheshire, Conn.

Velleman PF & Hoaglin DC. 1981. *Application, Basics and Computing of Exploratory Data Analysis* . Duxbury Press.

Weisberg S. 1985. *Applied Linear Regression* . John Wiley.

Wetherill GB. 1982. *Elementary Statistical Methods* . Chapman & Hall.

Wetherill GB. 1986. *Regression Analysis with Applications* . Chapman & Hall.

Learning Statistics: <http://freestatistics.altervista.org/en/learning.php>.

Free Statistical Softwares: <http://freestatistics.altervista.org/en/stat.php>.

Statistics Glossary http://www.cas.lancs.ac.uk/glossary_v1.1/main.html.

Course on Experimental design:
<http://www.stat.sc.edu/~grego/courses/stat706/>.

Design Resources Server: www.iasri.res.in/design.

Analysis of Data: Design Resources Server.
<http://www.iasri.res.in/design/Analysis%20of%20data/Analysis%20of%20Data.html>.