

Restructured and revised syllabi of PG Courses from Department of Agricultural Statistics

COURSE CODE	COURSE TITLE	CREDITS
STAT 502	STATISTICAL METHODS FOR APPLIED SCIENCES	3+1
STAT 511	EXPERIMENTAL DESIGNS	2+1
STAT 512	BASIC SAMPLING TECHNIQUES	2+1
STAT 513	NON-PARAMETRIC TECHNIQUES	2+1
STAT 521	APPLIED REGRESSION ANALYSIS	2+1
STAT 522	DATA ANALYSIS USING STATISTICAL PACKAGES	1+2

I. Course Title : Statistical Methods for Applied Sciences

II. Course Code : STAT 502

III. Credit Hours : 3+1

IV. Aim of the course

The students would be exposed to different statistical methods that would help them in understanding the importance of statistics. It would also help them in understanding the concepts involved in data presentation, analysis and their interpretation. The students would get an exposure to presentation of data, probability distributions, parameter estimation, tests of significance, regression and multivariate analytical techniques.

V. Theory

Unit I

Random variables: discrete and continuous, probability mass function and probability density function, mathematical expectation.

Unit II

Discrete and continuous probability distributions: binomial, Poisson, and normal distributions, Introduction of sampling distribution: chi-square, t and F distributions.

Unit III

Simple and multiple correlation, partial correlation, rank correlation, simple and multiple linear regression model, coefficient of determination.

Unit IV

Parametric tests based on normal, chi-square, t and F distributions.

Unit V

Introduction to sampling techniques.

VI. Practical

Problems related to the topics mentioned in the theory syllabus.

Outcome of the course:

Students will be well equipped to handle field level data for analysis and modelling purposes. They will learn how to draw a good sample from a population in order to draw valid inference about the population a population parameter and how to build multiple linear regression models and study correlation among them under a multivariable set-up.

VII. Suggested Readings

1. Bhattacharya, D. and Roychowdhury, S. *Probability and Statistical Inference: Theory and Practice*. 3rd Ed. U.N. DHUR and Sons Pvt. Ltd.
2. Bhattacharya, D. and Roychowdhury, S. *Statistics: Theory and Practice*. 3rd Ed. U.N. DHUR and Sons Pvt. Ltd.
3. Goon, A.M., Gupta, M.K. and Dasgupta, B. *Fundamentals of Statistics*. Vol. I & II. The World Press Pvt. Ltd.
4. Gupta, S.C. and Kapoor, V.K. *Fundamentals of Mathematical Statistics*. Sultan Chand and Sons.
5. Hogg, R.V. McKean, J.W. and Craig, A.T. *Introduction to Mathematical Statistics*. 8th Ed. Pearson.
6. Rohatgi, V.K. and Ehsan, S. *An Introduction to Probability Theory and Mathematical Statistics*. Wiley Eastern Private Ltd.
7. <http://freestatistics.altervista.org/en/learning.php>.
8. <http://www.statsoft.com/textbook/stathome.html>.

I. Course Title : Experimental Designs

II. Course Code : STAT 511

III. Credit Hours : 2+1

IV. Aim of the course

Designing an experiment is an integrated component of any research in almost all sciences. The students would be exposed to concepts of Design of Experiments so as to enable them to understand the concepts involved in planning, designing their experiments and analysis of experimental data.

V. Theory

Unit I

Need for designing of experiments, characteristics of a good design. Basic principles of designs- randomization, replication and local control.

Unit II

Uniformity trials, size and shape of plots and blocks, Analysis of variance, completely randomized design, randomized block design and Latin square design.

Unit III

Factorial experiments, (symmetrical as well as asymmetrical). orthogonality and partitioning of degrees of freedom. Concept of confounding.

Unit IV

Split plot and strip plot designs, missing plot techniques in randomized block and Latin square designs; transformations, combined analysis.

VI. Practical

Problems related to the topics mentioned in the theory syllabus.

Outcome of the course:

The students would be exposed to various concepts of designing an experiment so as to enable them understand the science involved in planning, designing their research experiments and how to make analysis of different experimental data.

VII. Suggested Readings

1. Cochran, W.G. and Cox, D.R. 1957. *Experimental Designs*. 2nd Ed. John Wiley & Sons.
2. Das, M.N. and Giri, N.C.: *Design and Analysis of Experiments*. Wiley Eastern Ltd.
3. Dean, A.M. and Voss, D. 1999. *Design and Analysis of Experiments*. Springer.
4. Fisher, R.A. 1953. *Design and Analysis of Experiments*. Oliver and Boyd.
5. Gomez, K.A. and Gomez, A.A. *Statistical Procedures for Agricultural Research*. 2nd Ed. John Wiley & Sons.
6. Gupta, S.C. and Kapoor, V.K. *Fundamentals of Applied Statistics*. Sultan Chand and Sons.
7. Hinkelmann, K. and Kempthorne, O.: *Design and Analysis of Experiments*. Vol. I. John Wiley & Sons.
8. Nigam AK and Gupta VK. 1979. *Handbook on Analysis of Agricultural Experiments*. IASRI
9. Pearce SC. 1983. *The Agricultural Field Experiment: A Statistical Examination of Theory and Practice*. John Wiley.
10. www.drs.icar.gov.in.

I. Course Title : Basic Sampling Techniques

II. Course Code : STAT 512

III. Credit Hours : 2+1

IV. Aim of the course

The students would be exposed to elementary sampling techniques. It would help them in understanding the concepts involved in planning and designing their surveys, presentation of survey data analysis of

survey data and presentation of results. This course would be especially important to the students of social sciences.

V. Theory

Unit I

Concept of sampling, sample survey vs complete enumeration, planning of sample survey, sampling from a finite population, bias, Sampling and non-sampling errors.

Unit II

Simple random sampling with and without replacement, determination of sample size, inverse sampling, Stratified sampling.

Unit III

Cluster sampling, Systematic sampling.

Unit IV

Multi-stage sampling, Introduction to PPS sampling.

VI. Practical

Problems related to the topics mentioned in the theory syllabus.

Outcome of the course:

It is expected that the students would be exposed to elementary sampling techniques. It would help them in understanding the concepts involved in planning and designing their surveys, presentation of survey from data sets which are non-normal and are not of quantitative nature.

VII. Suggested Readings

1. Bhattacharya, D. and Roychowdhury, S. *Probability and Statistical Inference: Theory and Practice*. 3rd Ed. U.N. DHUR and Sons Pvt. Ltd.
2. Cochran WG. 1977. *Sampling Techniques*. John Wiley.
3. Murthy MN. 1977. *Sampling Theory and Methods*. 2nd Ed. Statistical Publ. Soc., Calcutta.
4. Singh D, Singh P and Kumar P. 1982. *Handbook on Sampling Methods*. IASRI Publ.
5. Sukhatme PV, Sukhatme BV, Sukhatme S and Asok C. 1984. *Sampling Theory of Surveys with Applications*. Iowa State University Press and Indian Society of Agricultural Statistics, New Delhi.

I. Course Title : Nonparametric Techniques

II. Course Code : STAT 513

III. Credit Hours : 2+1

IV. Aim of the course

The students would be exposed to non-parametric tests and techniques. It would help them in applying non-parametric tests and understanding the concepts involved in analysing the data. This course would be especially important to the students of social sciences.

V. Theory

Unit I

Classification of data, variables and attributes, concept and scales of measurement, basic ideas of nonparametric procedures, need for nonparametric tests.

Unit II

Run test for the randomness, tests for location parameter: One sample and paired sample sign test and Wilcoxon signed-rank test, Mann-Whitney U-test for two independent samples.

Unit III

Kruskal-Wallis test (Nonparametric one-way ANOVA), Friedman's test (Nonparametric two-way ANOVA), Chi-square test for goodness of fit and independence of attributes.

VI. Practical

Problems related to the topics mentioned in the theory syllabus.

Outcome of the course:

It is expected that the students will develop skills to draw inference from data sets which are non-normal and are not of quantitative nature.

VII. Suggested Readings

1. Bhattacharya, D. and Roychowdhury, S. *Probability and Statistical Inference: Theory and Practice*. 3rd Ed. U.N. DHUR and Sons Pvt. Ltd.
2. Bhattacharya, D. and Roychowdhury, S. *Nonparametric Statistical Methods*. MEDITECH.
3. Conover W.J. *Practical Nonparametric Statistics*. John Wiley & Sons.
4. Gibbons J.D. *Non Parametric Statistical Inference*. 2nd Ed. Marcel Dekker.
5. Goon, A.M., Gupta, M.K. and Dasgupta, B. *Fundamentals of Statistics*. Vol. I. The World Press Pvt. Ltd.
6. Gupta, S.C. and Kapoor, V.K. *Fundamentals of Mathematical Statistics*. Sultan Chand and Sons.

I. Course Title : Applied Regression Analysis

II. Course Code : STAT 521

III. Credit Hours : 2+1

IV. Aim of the course

The students would be exposed to the concepts of correlation and regression. Emphasis will be laid on diagnostic measures such as autocorrelation, multi collinearity and heteroscedasticity. This course would prepare students to handle their data for analysis and interpretation.

V. Theory

Unit I

Bi-variate data, scatter diagram, introduction to correlation analysis and its measures, rank correlation, testing of population correlation coefficients.

Unit II

Multiple and partial correlation coefficients, method of least squares for curve fitting; testing of regression coefficients; Multiple regression.

Unit III

Diagnostic of multiple regression equation; Concept of weighted least squares, various methods of selecting the best regression equation.

Unit IV

Concept of nonlinear regression and fitting of quadratic, exponential and power curves; Economic and optimal dose.

VI. Practical

Problems related to the topics mentioned in the theory syllabus.

Outcome of the course:

It is expected that the students will develop skills to diagnostic measures such as autocorrelation, multi collinearity and heteroscedasticity. inference from data sets which are non-normal and are not of quantitative nature.

VII. Suggested Reading

1. Kleinbaum DG, Kupper LL, Nizam A. 2007. *Applied Regression Analysis and Other Multivariable Methods* (Duxbury Applied) 4th Ed.
2. Draper NR and Smith H. 1998. *Applied Regression Analysis*. 3rd Ed. John Wiley.
3. Ezekiel M. 1963. *Methods of Correlation and Regression Analysis*. John Wiley.
4. Koutsoyiannis A. 1978. *Theory of Econometrics*. MacMillan.
5. Kutner MH, Nachtsheim CJ and Neter J. 2004. *Applied Linear Regression Models*. 4th Ed. With Student CD. McGraw Hill.
6. Montgomery, D.C., Peck, E. and Vining, G. 2003. *Introduction to linear regression analysis*. John Wiley and Sons Inc., New York.

I. Course Title : Data Analysis Using Statistical Packages

II. Course Code : STAT 522

III. Credit Hours : 1+2

IV. Aim of the course

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

V. Theory

Unit I

Introduction to various statistical packages: Excel, R, SPSS. Data Preparation; Descriptive statistics; Graphical representation of data, Exploratory data analysis.

Unit II

Test for normality; Testing of hypothesis: Parametric and nonparametric tests.

Unit III

Data preparation for ANOVA, Analysis of basic designs, Split and strip plot design, Factorial Experiments, multiple comparisons.

Unit IV

Correlation and regression analysis, Probit and Logit Models.

Unit V

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

VI. Practical

Problems related to the topics mentioned in the theory syllabus.

Outcome of the course:

Some expertise on analysing data using software packages will be developed. Special skills will be developed for reading of the output tables and picking up of the right numbers from the output tables for inferential purposes. At the end, Skills will be developed in writing computer programmes when it is not available in the menu driven software packages. **This course would provide the students opportunities to improve their employability**

VII. Suggested Readings

1. Anderson C.W. and Loynes R.M. 1987. *The Teaching of Practical Statistics*. John Wiley.
2. Atkinson A.C. 1985. *Plots Transformations and Regression*. Oxford University Press.
3. Chambers J.M., Cleveland W.S., Kleiner B and Tukey P.A. 1983. *Graphical Methods for Data Analysis*. Wadsworth, Belmont, California.
4. Snell E.J. and Simpson HR. 1991. *Applied Statistics: A Handbook of GENSTAT Analyses*. Chapman and Hall.
5. Sprent P. 1993. *Applied Non-parametric Statistical Methods*. 2nd Ed. Chapman & Hall.

6. Velleman PF and Hoaglin DC. 1981. *Application, Basics and Computing of Exploratory Data Analysis*. Duxbury Press.
7. Wetherill GB. 1986. *Regression Analysis with Applications*. Chapman & Hall.
8. <http://freestatistics.altervista.org/en/learning.php>.
9. <http://freestatistics.altervista.org/en/stat.php>.
10. http://www.cas.lancs.ac.uk/glossary_v1.1/main.html.
11. <http://www.stat.sc.edu/~grego/courses/stat706/>.
12. www.drs.icar.gov.in.