Course Contents for Subjects with Code: STAT

This document only contains details of courses having code STAT.
Course Outline

Index Numbers and Time Series


Simple Regression and Correlation

Recommended Books
Course Outline

Discrete Random Variable and Discrete Probability Distributions
Random variable, distribution function, discrete random variable. Probability distribution of a discrete random variable. Joint distribution of two discrete random variables, marginal and conditional distributions, mathematical expectation and its properties, mean, variance and moments. Concept of m.g.f. and its properties. Uniform, Bernoulli, Binomial, Hypergeometric and Poisson distributions, mean, variance and shape of these distributions and their properties. Application of these distributions with examples from various fields. Multinomial distribution (only application).

Continuous Random Variables & Continuous Probability Distributions
Continuous random variables. Probability distribution of a single continuous random variable, probability density function and distribution function. Mean, variance and moments of continuous random variables. Uniform and Normal distribution. Mean, variance and shape of these distributions and their properties. Application of these distributions. Normal approximation to the Binomial and Poisson distribution (just application). Fitting of Normal distribution by area method.

Recommended Books
**BS (4 Years) for Affiliated Colleges**

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<th>Code</th>
<th>Subject Title</th>
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<tr>
<td>STAT-121</td>
<td>Business Statistics</td>
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<tr>
<td>1</td>
<td>Commerce</td>
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c. Simple Correlation and Regression. Lines of Regression. Method of least square and curve fitting with application to Business.
d. Index Numbers: Kinds of Index numbers with special emphasis to consumer price Index numbers.
e. Random Variables: Introduction, Discrete and Continuous Random variables. Chi-Square
f. Analysis of Variance (ANOVA).

**BOOKS RECOMMENDED (Latest Editions)**

### Course Outline

**Sampling**


Probability and non-probability sampling, sampling and non-sampling error. Calculation of sample mean, proportion and variance of simple random samples and stratified random samples. Sampling distribution of a statistic and its standard error. Distribution of sample mean, sample proportion, difference between two proportions and means. Central limit theorem with illustration (Proof not required).

**Statistical Inference**

Nature of statistical inference, point and interval estimation of parameter, properties of point estimator, confidence interval and its interpretation. Null and alternative hypothesis, simple and composite hypothesis. Type I and Type II errors. Level of significance. P-value and power of test (only concept and definition), Acceptance and rejection regions, one sided and two sided tests, test procedure. Inference about single mean and difference between means for paired and un-paired observations for small and large sample sizes. Inference about proportion and difference between two proportions. Determination of sample size. (Application of Normal distribution and t-distribution).

**Inference about Variance**

Introduction and application of Chi-square distribution: Interval estimation and test of hypothesis about population variance (Interval estimation for variance – single sample).

Introduction and application of F-distribution: test of hypothesis for equality of two variance.

#### Recommended Books

### Course Outline

Chi-square test of Independence, Chi square test of goodness of fit, Chi-square test of homogeneity.

### Regression and Correlation Analysis

Multiple linear regression with two regressors, coefficient of multiple determination. Partial and multiple correlation up to three variables. Inference of simple correlation and regression, partial and multiple correlation. Interval estimates and tests of hypothesis about parameters, mean prediction and individual prediction. Inference about regression & correlation.

### Analysis of Variance and Basic Experimental Designs

Analysis of variance for one-way classification and two-way classification. Multiple comparison tests; least significant difference and Duncans multiple range test. Basic principles of experimental design. Completely randomized, Randomized Complete Block and Latin Square Designs. Descriptions, layout, statistical analysis, advantages and limitations of these designs. Application of these designs (Analysis of all these designs for single observation in each cell).

### Recommended Books

Unit 1. What is Statistics?

Unit 2. Presentation of Data
Introduction, basic principles of classification and Tabulation, Constructing of a frequency distribution, Relative and Cumulative frequency distribution, Diagrams, Graphs and their Construction, Bar charts, Pie chart, Histogram, Frequency polygon and Frequency curve, Cumulative Frequency Polygon or Ogive, Histogram, Ogive for Discrete Variable. Types of frequency curves. Exercises.

Unit 3. Measures of Central Tendency
Introduction, Different types of Averages, Quantiles, The Mode, Empirical Relation between Mean, Median and mode, Relative Merits and Demerits of various Averages. Properties of Good Average, Box and Whisker Plot, Stem and Leaf Display, definition of outliers and their detection. Exercises.

Unit 4. Measures of Dispersion

Unit 5. Probability and Probability Distributions.
Discrete and continuous distributions: Binomial, Poisson and Normal Distribution. Exercises

Unit 6. Sampling and Sampling Distributions
Introduction, sample design and sampling frame, bias, sampling and non sampling errors, sampling with and without replacement, probability and non-probability sampling, Sampling distributions for single mean and proportion, Difference of means and proportions. Exercises.

Unit 7. Hypothesis Testing
Introduction, Statistical problem, null and alternative hypothesis, Type-I and Type-II errors, level of significance, Test statistics, acceptance and rejection regions, general procedure for testing of hypothesis. Exercises.

Unit 8. Testing of Hypothesis- Single Population
Introduction, Testing of hypothesis and confidence interval about the population mean and proportion for small and large samples, Exercises
Unit 9. Testing of Hypotheses—Two or more Populations
Introduction, Testing of hypothesis and confidence intervals about the difference of population means and proportions for small and large samples, Analysis of Variance and ANOVA Table. Exercises

Unit 10. Testing of Hypothesis—Independence of Attributes

Unit 11. Regression and Correlation

Recommended Books:
### Objectives

This course is aimed to introduce the concept of statistics, randomness and probability and build on these concepts to develop tools and techniques to work with random variables. The following topics will be covered in this course: Introduction to Statistics, Descriptive Statistics, Statistics in decision making, Graphical representation of Data Stem-and Lead plot, Box-Cox plots, Histograms and Ogive, measures of central tendencies, dispersion for grouped and ungrouped Data, Moments of frequency distribution; examples with real life, use of Elementary statistical packages for explanatory Data analysis. Counting techniques, definition of probability with classical and relative frequency, subjective approaches, sample space, events, laws of probability. General Probability Distributions, Conditional probability, Bayes theorem with application to Random variable (Discrete and continuous) Binomial, Poisson, Geometric, Negative Binomial Distributions, Exponential Gamma and Normal distributions, Regression and Correlation.

### Prerequisites

None

### Text Book


### Reference Material:

**Parametric and Nonparametric Tests**

**Course Outline**

1. Tests of hypothesis: parametric methods, Type I and Type II error, pointer of the test, Z-test, t-test, F-test.

**Books Recommended**


**Reference Books**

Course Outline


3. Covariance analysis for Completely Randomized, Randomized Complete Block and Latin Square designs; single and double covariates.

Books Recommended


Reference Books

Sampling Techniques

Course Outline:

Books Recommended

Reference Books
Probability Theory

Course Outline

Books Recommended

Reference Books
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<td>STAT-309</td>
<td>Statistical Computer Packages</td>
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**Year**

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<th>Discipline</th>
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<td>Statistics-I,II,III</td>
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**Statistical Computer Packages**

**Course Outline**

Introduction to Computer and Windows, Introduction to SPSS, Starting SPSS, How to exit from SPSS, Different windows in SPSS, Data Entry in SPSS: Defining a variable, Entering data, Saving data file, Defining Value Labels, Computing frequencies, Computing the new variables, Selection of cases, Defining Date Variable, Defining weights variable, Recoding and categorizing the existing variables, Categorizing the variables, Ranking the cases, Defining the missing values, Replacing the missing values, Creating a time series, Exploring the variable.

Finding descriptive statistics, Editing Output., Cross tabulation and measures of association, Entering a Cross-tabulated data, Graphs for variables and cross-tabulated variables, Merging and Splitting files, Bar Chart, Pie Chart, Histogram, and Historigram.

Box plot, P-P plot, Q-Q plot, One sample t-test, Independent Samples t-test, Paired samples t-test, Parametric statistical inference (one sample, Two sample, More than two sample).

Scatter Diagram, Correlation, Partial Correlation, and Regression Analysis: Simple and Multiple regressions, Non-Parametric Tests, Test of inference about proportions (one & several), Computing probability distribution and distribution functions.

**Recommended Books:**

2. Ho, Robert (2006), Handbook of Univariate and Multivariate Data Analysis and Interpretation with SPSS, Chapman and Hall/CRC.
Course Outline
1. Factorial experiments and its advantages. p×q Factorial in Randomized Complete Block designs. 2nd series Factorial experiments. Linear and quadratic components of main effects and interactions. 3rd series Factorial experiments.
4. Split-plot designs and Split-split plot designs.
5. Balanced incomplete and Partially Balanced incomplete block designs. Comparison of Incomplete Block design with Randomized Complete Block design. Youden Squares.

Books Recommended

Reference Books
Advanced Sampling Techniques

Course Outline
3. Two-stage sampling. Estimation of mean, total, proportion and variance. Both stages with equal probability. Two-stage sampling with units of unequal sizes, First stage PPS (with replacement) and second stage with equal probability. Both stages with probability proportional to size and with replacement. Sampling methods when a single primary unit is selected for the sample. Basic concept of double sampling.

Books Recommended

Reference Books
Multivariate Techniques

Course Outline:

Books Recommended

Reference Books
Probability Distributions

Course Outline
Continuous distributions: continuous uniform, normal, exponential, gamma, beta, lognormal, Weibull, Pareto and Cauchy distributions and their properties.


Books Recommended

Reference Books
FORTRAN Computer Language
Course Outline
Introduction to the Computers: History, Main Computers, Various Input and Output devices and Tips for the computer maintenance.

Introduction to Operating Systems, Introduction to DOS: DATE, TIME, COPY, XCOPY, FORMAT, DEL, RENAME etc. Commands.


Books Recommended

Reference Books

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<td>STAT-318</td>
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Year | Discipline
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3    | Statistics-I,II,III
Course Objectives
This course is designed to train the students in theoretical as well as applied statistics with particular reference to psychology. The statistical analysis is a very essential part of psychological research and students need to grasp the concepts, theoretical rational of use of certain statistical analysis and also to learn to carry out these analyses.

At the completion of course the students should be able to:

1. Understand basic concepts in statistical research.
2. Carry out statistical techniques of data analyses manually
3. Carry out statistical analyses using SPSS.
4. Interpret and discuss statistical results and present them in tables

Course Contents

Introduction
Defining Statistics
Descriptive and Inferential Statistics.
Scales of Measurement
Importance of Statistics in Psychology

Descriptive Statistics and Graphic Representation of Data
Data, Types of Data. frequency Distribution.
Cumulative frequency Distribution
Histogram, Polygon,
Pictograph, Bar Diagram, Pie Chart

Measures of Central Tendency and variability
Mean, Mode, Median
Range, Mean Deviation, Quartile Deviation, Variance, Standard Deviation, Shepherd ‘S Correction. Coefficient of Variation, Z. Scores.

Probability
Defining Probability,
Subjective Empirical And Classical Probability.
Laws of Probability.
Permutation and Combination.

Normal & Binomial Distribution
Normal distribution: its properties and application.
Binomial distribution: its properties and application.
Recommended Books

- Jakanovich
- McGraw Hill.
- Garrett, H.T. & Woodworth, R.S. Statistics in Psychology and Education.
- Guilford, J.P. & Fruchter, B. Fundamental Statistics in Psychology and Education.
- New York: Longmans.
- Terry Sircich Upper Saddle River, New Jersey.
Course Objectives
Students would have already completed basic computer skills course. This course is designed to enhance their competence in using computers for data analysis and literature search. At the end of course the students will be able to analyze data using SPSS and use psychological search engines.

Course Contents

Introduction to Statistical Package for Social Sciences (SPSS)
Basic features of SPSS
Entering Statistical data
Assigning variable names and values labels
Computing and Recording Techniques
Calculating descriptive statistics. (Including Mean, Median, Mode and Standard deviation)
Computing differences between Two Means by t-Test. (Independent and matched samples)
Computing differences between Multiple Group by t-Test. (One-Way ANOVA)
Computing Relationship between Variables (Correlation).
Regression Analysis.
Non parametric statistics.

Doing Online Literature Search Using search Engines: Yahoo, Google, Alta Vista
a. Using Data bases: Science Direct, Ebscohost, Black Synergy, Psychinfo, Medical Index etc.
b. How to make on line search effective.

Recommended Books

Pedagogy
This is a training course, which will be conducted in computer lab with guided instructions and practical work during each class.
### Course Objectives

This course is designed to train the students in theoretical as well as applied statistics with particular reference to psychology. The statistical analysis is a very essential part of psychological research and students need to grasp the concepts, theoretical rational of use of certain statistical analysis and also to learn to carry out these analyses.

At the completion of course the students should be able to:
- Carry out statistical techniques of data analyses according to the hypotheses been formulated.
- Interpret and discuss statistical results and present them in graphic and table form as well as able to report results in text form.

### Course Contents

**Testing Hypotheses.**
- Null and Alternative Hypotheses
- Acceptance And Rejection Regions
- One Tailed & Two Tailed Tests
- Type One and Type Two (I & II) Errors
- Level of Significance
- Testing The Hypotheses About Mean and Difference Between Means both Small And Large Samples. (T & Z Tests)
- Analysis of Variance, One Way and two way analysis of variance

**Correlation, Regression and Prediction**
- Correlation & Causation
- Pearson Product moment Correlation,
- Spearman's Rank Order Correlation.
- Regression analysis. Linear Regression. Scatter Diagram.
- Standard Error of Estimation.

**Introduction to Non Parametric Statistics**
- Introduction to Non-Parametric tests
- Chi Square Test (Contingency Table and Proportions)
- Yates Correction. Non Parametric tests. Wilcoxon test, Mann Whitney test, Sign test, Kruskal Wallis

### Recommended Books

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<tbody>
<tr>
<td>3</td>
<td>Applied Psychology</td>
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</table>
o New York
o Garrett, H.T. & Woodworth, R.S. Statistics in Psychology and Education.
o Guilford, J.P. & Fruchter, B. Fundamental Statistics in Psychology and Education.
o Moore, D. S. & McCabe, G. P. 1998 Introduction to the Practice of Statistics. 3rd
o New York: Longmans.
o Terry Sircich Upper Saddle River, New Jersey.
o Winer, S.B. Statistical Principles in Experimental Design. McGRaw Hill Book Company. N.Y.

Pedagogy
Lectures, Tutorials, student presentations, class discussions, invited lectures
**Course Outline**


**Recommended Books:**

Reference Books:

Course Outline

1. **Econometrics**

   Its nature, methodology and functions.

2. **Simple Linear regression**


3. **General Linear regression**


4. **Other topics**

   Stepwise regression, Ridge regression, GLR partitioned form: Estimator & testing of hypothesis, Use of extraneous information in linear regression. Restricted least squares estimator.
Recommended Books:


Reference Books

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<tr>
<td>STAT-405</td>
<td>C++ Computer Programming Language (Paper: Theory &amp; Practical equal marks)</td>
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<td>VII</td>
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Course Outline


Recommended Books:

## Course Outline

1. Introduction: Definition of Research, Types and Methods of Conducting Research, Census and Survey, Sampling frame, Types of errors in surveys (coverage, non-response, measurement, errors etc.) and methods of control of such errors, Steps for successful surveys.


3. Methods for conducting a Survey: Mail surveys, telephone surveys, face to face surveys, and drop off surveys.


5. Constructing a questionnaire for different types of surveys.


7. The analysis of Data.

8. Style and Format of report writing.

9. Preparing the report.

## Recommended Books:

Reference Books

- Grosh, Margaret, “Designing Household Survey Questionnaires for Developing Countries”, World Bank, New Age Int. 1999.
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<td>STAT-408</td>
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**Course Outline**


**Recommended Books:**


Reference Books

Course Outline

3. Heteroskedasticity: Reasons, tests, remedial measures.
4. Autocorrelation: Reasons, tests, remedial measures, consequences.
6. Other variables: Instrumental variables, Lagged variables, Dummy variables.
7. Other regression: Polynomial regression, Orthogonal polynomials and their use.
8. Systems of simultaneous linear equations: Reduced form equations, Simultaneous equations Bias. Identification (order and rank conditions), Methods of estimation for identified equations.

Recommended Books:

Reference Books:

Course Outline

1. Introduction to time series, time series analysis, Objectives of time series analysis, Components of time series, time series plots, time series and stochastic processes, special features of time series data, means, variance, auto-covariance, auto-correlation and partial auto-correlation for sample time series data.


Recommended Books:

Reference Books

BS (4 Years) for Affiliated Colleges

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Course Outlines


Introduction to linear programming. Graphical solution technique. Simplex Method, Application of Simplex Network.

Recommended Books

Course Outline

1. Model Building, various stages of model building, Identification of model from sample time series, steps for model identification, estimating the auto-covariance, auto-correlation function and partial auto-correlation function, pattern of theoretical ACF and PACF as a tool of model identification.

2. Estimating the parameters of an auto-regressive model, estimating the parameters of moving average, Back casting, dual estimation, mixed ARMA model and integrated model. The Box-Jenkins seasonal model. Model diagnostics; Residual analysis, over fitting and parameter redundancy, portmanteau tests. Model selection criteria, AIC, BIC.

3. Forecasting: Univariate procedures, Minimum mean square estimate of forecast, forecast weights, mean, variance and forecast limits for forecast, forecast error, minimum mean square forecast error, structure of minimum mean square forecast error. Multivariate procedures, comparison of forecasting procedures. Prediction theory.

Books Recommended


Reference Books

Course Outline

The Hotelling’s $T^2$ distribution. The linear discriminant function, Mahalanobis distances. Tests of hypotheses and confidence intervals for mean vectors: One sample and two-sample procedures. Multivariate statistical procedures: Discriminant analysis, Principal component analysis, Factor analysis, and Canonical correlation analysis.

Recommended Books:


Reference Books

Course Outlines


Books Recommended

Reference Books