

# ANDHRA KESARI UNIVERSITY

## MINOR

Subject: Statistics

w.e.f. AY 2023-24

### COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	II	1	Descriptive Statistics	3	3
			Descriptive Statistics Practical Course	2	1
II	III	2	Statistical Methods	3	3
			Statistical Methods Practical Course	2	1
	IV	3	Design and Analysis of Experiments	3	3
			Design and Analysis of Experiments Practical Course	2	1
		4	Numerical Analysis	3	3
			Numerical Analysis Practical Course	2	1

**SEMESTER-III**  
**COURSE 2: STATISTICAL METHODS**

Theory

Credits: 3

3 hrs/week

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**I. Learning Outcomes**

After successful completion of the course students will be able to:

1. To get the knowledge of estimating future values by using curve fitting.
2. To calculate the relationship between bivariate data.
3. To find the relationship about the multivariate data.
4. To acquaint about the forecasting of the data by using regression techniques.
5. To find the association of the categorical data by using attributes.

**II. Syllabus**

**Unit – 1: Curve fitting**

Bivariate data, Principle of least squares, fitting of  $k^{\text{th}}$  degree polynomial. Fitting of straight line, Fitting of Second degree polynomial or parabola, fitting of family of exponential curves and power curve.

**Unit – 2: Correlation**

Meaning, Types of Correlation, Measures of Correlation – Scatter diagram, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient (with and without ties), Properties. Bivariate frequency distribution, correlation coefficient for bivariate data and problems. Lag and Lead in correlation.

**Unit – 3:**

Coefficient of concurrent deviation, probable error and its properties, coefficient of determination, Concept of multiple and partial correlation coefficients (three variables only), properties and problems, intra-class correlation and correlation ratio.

**Unit – 4: Regression**

Concept of Regression, Linear and Non Linear regression. Linear Regression – Regression lines, Regression coefficients and its properties, Angle between two lines of regression. Regressions lines for bivariate data and simple problems. Correlation vs regression. Explained and Unexplained variations.

**Unit – 5: Attributes**

Notations, Class, Order of class frequencies, Ultimate class frequencies, Consistency of data, Conditions for consistency of data for 2 and 3 attributes only, Independence of attributes, Association of attributes and its measures, Relationship between association and colligation of attributes, Contingency table: Square contingency, Mean square contingency, Coefficient of mean square contingency, Tschuprow's coefficient of contingency.

**SEMESTER-III**  
**COURSE 2: STATISTICAL METHODS**

Practical

Credits: 1

2 hrs/week

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**Practical Syllabus**

1. Fitting of straight line by the method of least squares
2. Fitting of parabola by the method of least squares
3. Fitting of exponential curve of two types by the method of least squares.
4. Fitting of power curve of the type by the method of least squares.
5. Computation of correlation coefficient and regression lines for ungrouped data.
6. Computation of correlation coefficient for bivariate frequency distribution.
7. Computation of correlation coefficient, forming regression lines for grouped data.
8. Computation of partial and multiple correlation coefficients.
9. Computation of Yule's coefficient of association and colligation.
10. Computation of Pearson's, Tschuprow's coefficient of contingency.

**Note:** Training shall be on establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS word for writing inference.

**III. References**

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath & Co.
3. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd.
4. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

**IV. Suggested Co-curricular Activities:**

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

**SEMESTER-IV**  
**COURSE 3: DESIGN AND ANALYSIS OF EXPERIMENTS**

Theory

Credits: 3

3 hrs/week

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**I. Learning Outcomes**

After successful completion of the course students will be able to:

1. To acquaint with the role of statistics in different fields with special reference to agriculture.
2. Learn to apply the one of the design of experiment to agricultural fields.
3. Learn to apply the randomization to the blocks of various fields in agriculture.
4. To get the familiarity about applications of three principles.
5. Learn to deal the agricultural fields with different factors and levels.
6. To use appropriate experimental designs to analyze the experimental data.

**II. Syllabus**

**Unit – 1: Analysis of variance (ANOVA)**

Concept, Definition and assumptions. ANOVA one way classification – mathematical model, analysis – with equal and unequal classification. ANOVA two way classification – mathematical model, analysis and problems.

**Unit – 2: Completely Randomised Design (CRD)**

Definition, terminology, Principles of design of experiments, CRD – Concept, advantages and disadvantages, applications, Layout, Statistical analysis. Critical Differences when hypothesis is significant.

**Unit – 3: Randomised Block Design (RBD)**

Concept, advantages and disadvantages, applications, Layout, Statistical analysis and Critical Differences. Efficiency of RBD relative to CRD. RBD with one missing value and its analysis, problems.

**Unit – 4: Latin Square Design**

Concept, advantages and disadvantages, applications, Layout, Statistical analysis and Critical Differences. Efficiency of LSD over RBD and CRD. Estimation of one missing value in LSD and its analysis, problems.

**Unit – 5: Factorial experiments**

Main effects and interaction effects of  $2^2$  and  $2^3$  factorial experiments and their Statistical analysis. Yates procedure to find factorial effect totals.

**SEMESTER-IV**  
**COURSE 3: DESIGN AND ANALYSIS OF EXPERIMENTS**

Practical

Credits: 1

2 hrs/week

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**Practical Syllabus**

1. ANOVA - one - way classification with equal number of observations.
2. ANOVA - one - way classification with unequal number of observations.
3. ANOVA Two-way classification.
4. Analysis of CRD and critical differences.
5. Analysis of RBD and critical differences. Relative efficiency of CRD with RBD.
6. Estimation of single missing observation in RBD and its analysis.
7. Analysis of LSD and efficiency of LSD over CRD and RBD.
8. Estimation of single missing observation in LSD and its analysis.
9. Analysis of  $2^2$  with RBD layout.
10. Analysis of  $2^3$  with RBD layout.

**Note:** Training shall be on establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS word for writing inference.

**I. References**

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Applied Statistics, Sultan Chand&Sons, New Delhi.
2. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI.
3. M. R. Saluja: Indian Official Statistics. ISI publications.

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**SEMESTER-IV**  
**COURSE 4: NUMERICAL ANALYSIS**

Theory

Credits: 3

3 hrs/week

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**I. Learning Outcomes**

After learning this course the student will be able

1. Learn the different difference operators and applications.
2. Accustom with the interpolation techniques with equal and unequal intervals.
3. Able to use numerical differentiation tools.
4. Familiar to use numerical integration methods.

**II. Syllabus**

**Unit 1**

Definitions of Forward difference operator ( $\Delta$ ), Backward difference operator, Shift or Extension (displacement) operator (E), Central Differences operator ( $\mu$ ), Differentiation operator (D), Mean value operator Symbolic relations between operators, properties of difference and shift operators, fundamental theorem on finite differences and simple problems.

**Unit 2**

**Interpolation with equal intervals:** Concept of interpolation and extrapolation, assumptions and uses of interpolation, difference tables, methods of interpolation with equal intervals - Newton's formula for forward and backward interpolation, Central differences, Gauss forward and backward, Sterling, Bessel's and Laplace - Everett's Formulae.

**Unit 3**

**Interpolation with unequal intervals:** Divided differences and their properties. Methods of interpolation with unequal intervals – Newton's Divided difference formula and Lagrange's formula. Inverse interpolation - Lagrange's formula.

**Unit 4**

**Numerical Differentiation:** Introduction to Numerical differentiation. Determination of First and Second order derivatives for the given data using Newton's forward and backward, Gauss forward and backward, Sterling, Bessel's and Newton's Divided difference formula.

**Unit 5**

**Numerical Integration:** Introduction to numerical integration, General Quadrature formula for equidistant ordinates, Trapezoidal rule, Simpson's  $1/3^{\text{rd}}$ , Simpson's  $3/8^{\text{th}}$  rule and Weddle's rule.

**SEMESTER-IV**  
**COURSE 4: NUMERICAL ANALYSIS**

Practical

Credits: 1

2 hrs/week

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**Practical Syllabus**

1. Interpolation by using Newton-Gregory forward and backward difference formulae.
2. Interpolation by using Gauss forward and backward difference formulae.
3. Interpolation by using Sterling and Bessel's formulae.
4. Interpolation by using Laplace-Everett's Formula.
5. Interpolation by using Newton's divided difference and Lagrange's formulae.
6. Inverse interpolation by using Lagrange's formula.
7. Determination of first and second order derivatives by using Newton-Gregory forward and backward difference formulae.
8. Determination of first and second order derivatives by using Gauss forward and backward difference formulae.
9. Determination of first and second order derivatives by using Newton's divided difference formula.
10. Numerical Integration by using Trapezoidal rule, Simpson's  $1/3^{\text{rd}}$ , Simpson's  $3/8^{\text{th}}$  rule and Weddle's rule.

**III. References**

1. H. C. Saxena: Finite Differences and Numerical Analysis, S. Chand and Company, New Delhi.
2. P. P. Gupta, G. S. Malik & Sanjay Gupta: Calculus of Finite Differences and Numerical Analysis, Krishna Prakashan Media(P) Ltd., Meerut(UP), India.
3. S. S. Sastry: Introductory Methods Numerical Analysis, Prentice- Hall of India.
4. C. F. Gerald and P. O. Wheatley: Applied Numerical Analysis, Addison- Wesley, 1998.

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ANDHRA KESARI UNIVERSITY-ONGOLE, PRAKASAM DISTRICT  
Minor Programme from the Year 2023-24 Onwards  
Programme-B.Sc. / B.A. Honours Mathematics -Question Paper model,  
Second Year-Semester-III & IV

Time: 3 Hours

Total Marks: 75

PART –A

Answer any Five of the following

5X5=25 Marks

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10

PART –B

Answer the following

5x10=50 Marks

- 11a.
- 11b.
- 12a.
- 12b.
- 13a.
- 13b.
- 14a.
- 14b.
- 15a.
- 15b

Or

Or

Or

Or

Or