

SEMESTER-IV
STATISTICS MAJOR
COURSE 9: SAMPLING TECHNIQUES

Theory

Credits: 3

3 hrs/week

I. Learning Outcomes

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

1. To review about the population and its concepts also methods to collect data and errors to deal.
2. Introduced to various statistical sampling schemes such as simple, stratified and systematic sampling.
3. An idea of conducting the sample surveys and selecting appropriate sampling techniques.
4. Knowledge about comparing various sampling techniques.
5. To use appropriate factorial experimental to analyse the experimental data.

II. Syllabus

Unit – 1: Theory of sample surveys

Principal steps in conducting large scale sample survey - Sampling and non – sampling errors – Controlling - Advantages of sample over census survey – Limitations - Types of sampling – Concepts of subjective , probability and mixed sampling.

Unit – 2: Simple Random Sampling

Notations and terminology – Definitions – Properties - drawbacks – Differences between SRSWOR and SRSWR Methods -Methods of selecting simple random samples - Lottery method and Random numbers tables and its uses. Estimates of population mean, total, their variances and standard errors.

Unit – 3: Stratified random sampling

Stratified random sampling - Advantages and Disadvantages of Stratified Random sampling - Estimation of population mean and its variance - Stratified random sampling with proportional and optimum allocations - Comparison between proportional and optimum allocations with SRSWOR.

Unit – 4: Systematic sampling

Systematic sampling – Definition - Merits and demerits of systematic sampling - Estimate of mean and variance - Comparison of systematic sampling with Stratified and SRSWOR - Comparison of variance of SRS, St.R.S and Sy.Sampling for a linear trend.

Unit – 5: Official Statistics

National Statistical Organization - Vision and mission -Indian statistical system and its growth – CSO and NSSO – Functions, roles, responsibilities, publications .

National income – Concepts - Advantages and Disadvantages – Method and difficulties in estimating national income.

SEMESTER-IV
STATISTICS MAJOR
COURSE 9: SAMPLING TECHNIQUES

Practical

Credits: 1

2 hrs/week

III. Syllabus

1. Show the sample mean is unbiased estimator of population mean in SRSWOR and also find variance of sample mean.
2. Show the sample mean square is unbiased estimator of population mean square in SRSWOR.
3. Show the sample mean is unbiased estimator of population mean in SRSWR and also find variance of sample mean.
4. Variance of sample mean in St.RS method
5. Proportional and optimum allocations
6. To show that $V(\text{opt}) \leq V(\text{prop}) \leq V(\text{ran})$
7. Systematic sampling

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.

IV. 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.

V. 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.
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MODEL PAPER
SEMESTER-IV
STATISTICS MAJOR
COURSE 9: SAMPLING TECHNIQUES

Time: 3hrs

Max.Marks :

70**Section - A**

Answer any Five of the following questions.

5X4=20M

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

Section - B

Answer All Questions. Each Question carries 10 Marks.

5X10=50M

9. a)

Or

b)

10. a)

Or

b)

11. a)

Or

b)

12. a)

Or

b)

13. a)

Or

b)

SEMESTER-IV

STATISTICS MAJOR COURSE 10: ANALYSIS AND DESIGN OF EXPERIMENTS

Theory

Credits: 3

3 hrs/week

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 analyse the experimental data.

II. Syllabus

Unit – 1: Analysis of variance (ANOVA)

Definition, assumptions and uses - One way, two way classifications - Assumptions, merits, demerits, parameter estimations - Analysis of variances.

Unit – 2: Design of experiments and CRD

Definition – Terminology- Basic principles of design of experiments – Completely Randomised Design(CRD) -definition, assumptions, advantages and disadvantages – Layout - Statistical analysis.

Unit – 3: Randomised Block Design (RBD)

Definition, assumptions, advantages and disadvantages – Layout - Statistical analysis. RBD with one missing value and its analysis - Efficiency of RBD relative to CRD.

Unit – 4: Latin Square Design (LSD)

Definition, assumptions, advantages and disadvantages – Layout - Statistical analysis. LSD with one missing value and its analysis - Efficiency of LSD relative to CRD – Efficiency of LSD relative to RBD

Unit – 5: Factorial experiments

Definition, merits, demerits – Types of factorial experiments – Main effects and interaction effects – Relationships – contrast – Orthogonal contrast – Yates procedure to find factorial effect totals – Statistical analysis of 2^2 and 2^3 factorial experiments in case of RBD.

SEMESTER-IV

STATISTICS MAJOR COURSE 10: ANALYSIS AND DESIGN OF EXPERIMENTS

Practical

Credits: 1

2 hrs/week

III. Syllabus

1. One - way classification with equal number of repetitions.
2. One - way classification with un equal number of repetitions.
3. Two-way classification.
4. Analysis of CRD
5. Analysis of RBD
- 6 Missing observation in RBD
- 7 Analysis of LSD
8. Missing observation in LSD
9. Analysis of 2^2 with RBD layout.
10. Analysis of 2^3 with RBD layout.

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MODEL PAPER

SEMESTER-IV

STATISTICS MAJOR

COURSE 10: ANALYSIS AND DESIGN OF EXPERIMENTS

Time: 3hrs

Max.Marks :

70Section - A

Answer any Five of the following questions.

5X4=20M

- 1.
- 2.
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Section - B

Answer All Questions. Each Question carries 10 Marks. 5X10=50M

9. a)

Or

b)

10. a)

Or

b)

11. a)

Or

b)

12. a)

Or

b)

13. a)

Or

b)

SEMESTER-IV
STATISTICS MAJOR
COURSE 11: NUMERICAL ANALYSIS

Theory **Credits: 3** **3 hrs/week**

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 : Finite differences

Definitions of the operators Δ , ∇ and E - Relationships and properties - Difference table - Estimating missing values - Fundamental theorem on finite differences and simple problems.

Unit 2 : Interpolation

Concepts of interpolation and extrapolation - Assumptions and uses of interpolation - Newton's forward and backward interpolation formulae - Interpolation with unequal intervals - Divided differences and their properties- Newton's Divided difference formula - Inverse interpolation - Lagrange's formula

Unit 3 :Central differences

Definition - Properties - Gauss forward and backward, Sterling's, Bessel's and Laplace - Everett's central difference Formulae.

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's, Bessel's and Newton's Divided differences formulae.

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
STATISTICS MAJOR
COURSE 11: NUMERICAL ANALYSIS

Practical **Credits: 1** **2 hrs/week**

III. Syllabus :

1. Newton-Gregory forward interpolation formula
2. Newton-Gregory backward interpolation formula
3. Newton's divided differences interpolation formula
4. Lagrange's formulae
5. Gauss forward differences formula.
6. Gauss backward differences formula.
7. Sterling's formula.
8. Bessel's formulae.
9. Laplace-Everett's formula.
10. Newton's forward differentiation.
11. Newton's backward differentiation.
12. Gauss forward and backward differentiation.
13. Trapezoidal rule.
14. Simpson's $1/3^{\text{rd}}$, Simpson's $3/8^{\text{th}}$ rules

IV. 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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SEMESTER-IV

STATISTICS MAJOR

COURSE 11: NUMERICAL ANALYSIS

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Max.Marks :

70 Section – A

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Section – B

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9. a)

Or

b)

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Or

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12. a)

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b)

13. a)

Or

b)