

**SWAMI RAMANAND TEERTH
MARATHWADA UNIVERSITY, NANDED**



**SYLLABI
OF
STATISTICS**

**B. A. / B. Sc. (Third Year)
Semester V (Fifth)**

**Paper-XII Sample Survey Analysis
(Compulsory)**

**Paper-XIII Linear Programming (Elective)
OR**

**Paper-XIV Statistical Quality Control
(Elective)**

Semester VI (Sixth)

**Paper-XV Design of Experiments
(Compulsory)**

**Paper-XVI Operations Research (Elective)
OR**

**Paper-XVII Demography (Elective)
Practical (Annual Pattern)**

Paper –XVIII Practical - IV (Compulsory)

Paper –XIX Practical - V (Elective)

OR

Paper XX Practical VI (Elective)

(With Effect from June 2011)

Semester -V
Sample Survey Analysis (Compulsory)
Paper-XII

Unit-I- Sample Survey:-Concepts of population and sample, sample size, sampling unit, sampling frame, Parameters and statistics, sampling Distribution, Principle steps in Sample Survey, Principle Sample Survey, sampling and non sampling errors, advantages of sampling over complete census, Limitations of sampling.

Unit-II-Types of sampling, Random and Non random sampling, Methods of achieving randomness.

Unit-III- Simple random sampling with and without replacement ,probability of selecting any specified unit in the sample, selection of simple random sample, Notation and terminology ,Estimation of population mean and its standard error, Merits and demerits of Simple Random sampling , Simple Random sampling of attributes, size of simple random sample for specified precision, Limitations of simple random sampling.

Unit-IV-Stratified Random sampling: sampling from heterogeneous population, Notation and terminology, Allocation of sample size, Proportional Allocation, Neyman Allocation. Estimation of population mean and its variance with Standard under each allocation and their comparison, Proportional allocation Vs simple random sampling.

Unit -V-Systematic sampling, sampling Interval, Notation and terminology, Variance of Estimated mean, relation between Systematic sampling and Simple Random sampling, Merits and Demerits of Systematic sampling.

Scope of syllabi:-

i) Fundamentals of applied statistics-S. C. Gupta and V. K. Kapoor (Sultan Chand and Sons)

Chapter 7:- 7.1,7.2,7.2.1,7.3,7.4,7.5,7.6,7.7,7.8,7.9,7.9.1, 7.9.2, 7.9.3, 7.9.4, 7.9.5, 7.9.6,7.10, 7.10.1, 7.10.2, 7.10.3, 7.10.4,7.11, 7.11.1, 7.11.2,

Theorem 7.1, 7.2, 7.3, 7.6, 7.7, 7.8, 7.9, 7.10

Reference Books:-

i) Murty M. N. (1967): Sampling Theory and Methods, Statistical publishing Society Calcutta.

ii) Sukatme B.V. (1984): Sampling Theory and Applications ,Indian Society of Agricultural Statistics.

iii) Desraj (2000):Sample survey theory Narosa publishing House

iv) Singh D and Chaudhri F. S. :Theory and analysis of Sample Survey Design.

Semester - V
Linear Programming (Elective)
Paper-XIII

Unit-I-Basics of operations Research: Introduction, scope, definition of operations research, Objectives of operations research, Phases of operations research, scope of operations research, Limitations of operations research.

Unit-II-Linear Programming Problem: Introduction, General Linear programming problems, Mathematical Formulation of L.P.P .,Basic solution ,Non degenerate and Degenerate Basic solution, Important Terms Important definitions ,Convex set and Terms on it.

Unit-III- Solution of L.P.P. by Graphical Method ,Simplex method, Slack and surplus variables, some definitions and Notations Fundamental Terms of L.P.P(Only statement). B.F.S. from feasible solution, computational procedure of L.P.P, artificial variables, bigM-method, Numerical problems.

Unit- IV- Assignment problem :Introduction, Assignment problem, Mathematical Formulation of an Assignment problem, Unbalanced Assignment problem, method for solving an minimal Assignment problem (Assignment algorithm).

Unit-V-Transportation problem: Introduction, Difference between Transportation problem and Assignment problem, Important definitions, solution of Transportation problem, Initial feasible solution ,North-West corner rule method, Lowest-cost entry method, Vogel's approximation method, Optimality test ,computational procedure of Optimality test(Modified Distribution method),Degeneracy in Transportation problem, unbalanced Transportation problem.

Scope of syllabi:-

I) Dr .R. K. Gupta:-Linear Programming (Krishna Publication Media (P) Ltd Meerut. Tenth Edition.

1. Chapter 1: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8
2. Chapter 2: 2.1, 2.2, 2.3, Theorems I,II (a) II(b) III,IV,VI,VII
3. Chapter 3: 3.1,3.2,3.3,3.4,3.5,3.12,3.13
4. Chapter 10 and Chapter 11complete.

Reference Books:-

- 1) Gass E. :Linear Programming Method and Application. Narosa publishing House New Delhi.
- 2) Dr.R.K.Gupta – Operations Research (Krishana Prakashan Media(P) Ltd . 11- Shivaji Road Meerut)
- 3) Sharma .S.D.-Operations Research.(Kedarnath Ramnath and Co. Meerut)
- 4) Manju Sharma –Linear Programming(Ramprasad and Sons Ag ra-3)

Semester - V
Statistical Quality Control (Elective)
Paper-XIV

Unit-I- Statistical Quality Control: Meaning and purpose SQC, Quality of product, process control, product control, Assignable causes, Chance causes, Seven process control tool, Uses of SQC, Control charts, 3-sigma control limits, specification limits, natural tolerance process.

Unit-II- Control charts:- Control Charts for variables: X-bar, R and X-bar, Sigma chart, Construction, working revision, Interpretation of X-bar and R Chart.

Unit -III- Control Chart for Attributes: Defects, Defectives, fraction defective, Control chart for fraction defective (p-chart), control chart for number of defectives (d chart), Interpretation of charts, control chart for number of defects C-chart, Application of C-chart, Limitations of C-chart.

Unit-IV - Acceptance Sampling Plan: Acceptance Sampling for attributes with rectification, Acceptance Quality level(AQL), Lot tolerance proportion defectives (LTPD), Consumer's risk, Producers risk, O.C. curve, Average Outgoing Quality Limit (AOQL) for Single Sampling Plan. Introduction to Double Sampling Plan, Comparison between Single Sampling Plan and Double Sampling Plan.

Unit-V - Decision Analysis: loss function, risk function, randomized and non-randomized decision rule. Decision principles (Conditional Bayes, Frequentist). Testing and estimation problem as decision problems. Optimal decision rule.

Scope of syllabi: --

1. S.C.Gupta, V.K.kapoor: Fundamentals of applied statistics (Sultan Chand and Sons, New Delhi)

Chapter 1: 1.0, 1.1, 1.2, 1.3, 1.4, 1.5.1, 1.5.2, 1.5.3, 1.5.4

1.6, 1.6.1, 1.6.2, 1.6.3, 1.7, 1.7.1, 1.7.2, 1.7.3,

1.9.1, 1.9.2, 1.9.3, 1.9.4, 1.9.5, 1.9.6, 1.9.7, 1.9.8, 1.11.1, 1.11.2, 1.11.3

2. Kanti Swarup, P. K. Gupta, Man Mohan : Operations Research: (Sultan Chand and Sons, New Delhi)

Chapter: 16.1, 16.2, 16.3, 16.4, 16.5, 16.6, 16.7

Reference Books:-

I) Grant.E.L-Statistical Quality Control-

II) -Motgomery .D.C.-Introduction to Statistical Quality Control

III) Mahajan- Statistical Quality Control-

IV) Duncaan A. J.-Quality Control and Industrial Statistics – (D.B. Tataporewala and Sons Co Mumbai)

V) Berges J.O.: Statistical Decision Theory and Bayesian Analysis.

Semester - VI
Design of Experiments (Compulsory)
Paper-XV

Unit-I- Analysis of variance: Introduction, One way, two way classification with one observation per cell, Analysis of two way classified data with an observation per cell, Mathematical Model, ANOVA table, Hypotheses to be tested.

Unit-II- Design of Experiments:- Introduction, Notation and terminology, Principles of an Experimental Design, Replication, Randomization, Local control, size of plot, Analysis of Completely Randomized Design (CRD).

Unit-III- Randomized Block Design (RBD), Statistical analysis of RBD for one observation per experimental unit, Comparison of CRD with RBD in terms of efficiency, Missing value in RBD.

Unit-IV- Latin Square Design: Analysis of Latin Square Design, Advantages and disadvantages of Latin Square Design, efficiency of LSD compared with CRD and RBD, Missing value in LSD.

Unit-V- Factorial Experiments: Factorial Experiment purpose, need, advantages of factorial Experiments, Analysis of 2^2 and 2^3 Factorial Experiments, Yates method of computing factorial effect total, ANOVA table.

Scope of syllabi:-

1. Fundamentals of applied statistics-S. C. Gupta,V. K. Kapoor(Sultan Chand and Sons)
 Chapter 5:-5.1, 5.2, 5.3,
 Chapter 6.6,1.6.2,6.3,6.3.1, 6.3.2, 6.4, 6.6.4, 6.5, 6.5.1, 6.6, 6.6.1,6.6.3,6.6.4, 6.7,6.7.1,6.7.3,6.8, 6.8.1, 6.8.2

Reference Books:-

- i) Das .M.N. and Giri (1986): Design and Analysis of Experiments, Springer Verlag
- ii) Kempthorne O : The Design and analysis of Experiments
- iii)Singh D and Chaudhri F.S:Theory and analysis of Sample Survey Design.

Semester - VI
Operations Research (Elective)
Paper-XVI

Unit-I- Sequencing problem: Introduction, Sequencing problem ,General Assumptions, Sequencing Decision problem for n-jobs on two Machines.

Unit -II- Traveling salesmen problem, solution of Traveling salesmen problem, Introduction to Queueing Theory and Simulation.

Unit-III-Game Theory, Introduction, Competitive game, Finite and Infinite Game, Zero-sum game, Two Person Game Zero-sum game, Payoff Matrix ,Strategy, Solution of a game, value of a game ,Saddle point, Solution of a rectangular game with Saddle point, Solution of 2 x 2 game without Saddle point ,Dominance Property, Graphical Method for the , Solution of 2 x n and m x 2 games.

Unit-IV-Network Analysis: Introduction, Network and basic components, Activity, Event, logical sequencing, Rules for network construction, Critical path analysis Forward pass calculation, Backward pass calculation.

Unit V- Critical path, Float of an activity and Event, Probability consideration in PERT, Distinguish between PERT and CPM, Queueing Theory and Simulation.

Scope of syllabi:-

I) Kanti Swarup, P.K.Gupta, Man Mohan: -Operations Research (Sultan Chand & Sons) Ninth Edition.

1. Chapter 11: 11.6
2. Chapter 12: 12.1, 12.2, 12.3, 12.4, 12.5
3. Chapter 17: 17.1, 17.2, 17.3, 17.4, 17.5, 17.6, 17.7
4. Chapter 20: 20.1, 20.2, 20.3,
5. Chapter 21: Complete.
6. Chapter 23: 23.1, 23.2, 23.3, 23.4, 23.4, 23.5, 23.6, 23.7.

Reference Books:-

- 1) Gass E.: Linear Programming Method and Application. Narosa publishing House New Delhi.
- 2) Dr.R.K.Gupta – Operations Research (Krishana Prakashan Media(P) Ltd . 11- Shivaji Road Meerut)
- 3) Sharma .S.D.-Operations Research.(Kedarnath Ramnath and Co. Meerut)
- 4) Manju Sharma –Linear Programming(Ramprasad and Sons Ag ra-3)
- 5) G. Gopikuttan-Quantitative Methods and Operations Research (Himalaya publishing House.

Semester - VI
Demography (Elective)
Paper-XVII

Unit-I- Elements of Demography: Introduction and uses of vital statistics, Methods of obtaining vital statistics by registration and census method ,Measurement of population Rates and Ratios of vital events.

Unit-II - Measurement of mortality, Crude Death Rate(CDR), Specific Death Rates (SDR), Age Specific Death Rates (ASDR), Infant Mortality Rate (IMR), Standardized Death rate (STDR), Force of Mortality.

Unit-III- Fertility and Reproduction Rates: Fertility Rate, Sex ratio ,Crude Birth Rate (CBR), Merits and Demerits, General Fertility Rate (GFR), Age Specific Fertility Rate, Total Fertility Rate (TFR).

Unit-IV-Gross reproduction Rate (GRR), Net reproduction rate (NRR), Stationary Population, Stable Population. Life table, construction of Life table and uses, Central Mortality rate. Measurement of population growth, Abridged life tables.

Unit-V- Psychological and Educational Statistics: Introduction, Scaling individual test items in terms of difficulty(sigma scaling), scanning of scores on a test, percentile scores, scanning of ranking in terms of normal probability curve, scanning of ratings in terms of normal curves.

Scope of syllabi: --

1. Fundamentals of Applied Statistics-S. C. Gupta,V. K. Kapoor(Sultan Chand and Sons)

I) Chapter 8: 8.1, 8.2, 8.3, 8.3.1, 8.3.2,8.3.3, 8.3.4, 8.4,8.5, 8.6

II)Chapter 9: 9.1, 9.1.1, 9.1.2, 9.2, 9.3, 9.4, 9.4.1, 9.4.2, 9.4.3, 9.5, 9.5.1, 9.5.2, 9.5.3, 9.5.4, 9.5.5 9.5.6, 9.6, 9.7, 9.7.1, 9.7.2, 9.7.3, 9.7.4,9.8, 9.8.2, 9.8.3.

Reference Books:-

I)Shrivastava O.S:-A Textbook of Demography

II) Grant.E.L-Statistical Quality Control-

III) -Motgomery .D.C-.Introduction to Statistical Quality Control

Iv) Mahajan- Statistical Quality Control-

V) Duncaan.A.j-Quality Control and Industrial Statistics –(D.B.Tataporewala and Sons Co Mumbai)

Vi) S. P. Gupta -Statistical Methods .

Vii)Benjamin. B-Elements of Vital Statistics.

STATISTICS

B.A. / B.Sc. (Third) Year

Paper –XVIII

Practical - IV (Compulsory)

(Annual Pattern)

| Sr. No. | Name of the Experiments | No. of Practicals |
|---------|--|-------------------|
| 1. | Drawing Simple Random Sample | 1 |
| 2. | Estimation of population mean using SRS | 2 |
| 3. | Estimation of Variance using SRS | 1 |
| 4. | Estimation of population mean and variance Using different allocations in Stratified random sampling | 1 |
| 5. | Estimation of gain in precision due to stratification | 1 |
| 6. | Determination of sample size in stratified sampling | 1 |
| 7. | Estimation of population mean and variance In systematic sampling | 1 |
| 8. | ANOVA one way classification | 2 |
| 9. | ANOVA two way classification with one entry per cell | 2 |
| 10. | Analysis of Completely Randomized Design | 1 |
| 11. | Analysis of Randomized Block Design | 1 |
| 12. | Analysis of Latin Square Design | 1 |
| 13. | Missing plot Technique of RBD | 1 |
| 14. | Missing plot Technique of LSD | 1 |
| 15. | Efficiency of LSD over RBD | 1 |
| 16. | 2^2 Factorial Experiment | 1 |
| 17. | 2^3 Factorial Experiment | 1 |

STATISTICS

B.A. / B.Sc. (Third) Year

Paper –XIX

Practical - V (Elective)

(Annual Pattern)

| Sr. No. | Name of the Experiments | No. of Practicals |
|---------|--|-------------------|
| 1. | Formulation of Linear Programming Problem | 2 |
| 2. | Solution of L.P.P. by Graphical method | 2 |
| 3. | Basic feasible solution of L.P.P. | 2 |
| 4. | Solution of L. P.P by Simplex method | 2 |
| 5. | Solution of L. P.P by Big-M method | 1 |
| 6. | Assignment problem | 2 |
| 7. | North-West Corner Rule method | 1 |
| 8. | Matrix Minima method | 1 |
| 9. | Vogel's Approximation Method | 1 |
| 10. | Optimality test | 1 |
| 11. | Unbalanced Transportation problem | 1 |
| 12. | Game with and without Saddle point | 2 |
| 13. | Graphical method to solve 2 x n and m x 2 game | 2 |
| 14. | Dominance Property | 1 |
| 15. | Sequencing | 2 |
| 16. | Queuing | 1 |
| 17. | Simulation | 1 |
| 18. | Traveling salesman problem | 1 |
| 19. | PERT | 1 |
| 20. | CPM | 1 |

STATISTICS

B.A. / B.Sc. (Third) Year

Paper –XX

Practical - VI (Elective)

(Annual Pattern)

| Sr. No. | Name of the Experiments | No. of Practicals |
|---------|-------------------------------------|-------------------|
| 1. | X-bar and R chart | 2 |
| 2. | P and C chart | 2 |
| 3. | O.C. curve for single Sampling plan | 1 |
| 4. | O.C. curve for double Sampling plan | 1 |
| 5. | AOQ and ASN curve | 1 |
| 6. | Crude Death Rate (CDR) | 1 |
| 7. | Specific Death Rate(SDR) | 1 |
| 8. | Age Specific Death Rate(ASDR) | 1 |
| 9. | Standardized Death Rate(STDR) | 1 |
| 10. | Life table | 2 |
| 11. | Crude Birth Rate(CBR) | 1 |
| 12. | General Fertility Rate(GFR) | 1 |
| 13. | Specific Fertility Rate(SFR) | 2 |
| 14. | Total Fertility Rate (TFR) | 1 |
| 15. | Gross Reproduction Rate(GRR) | 1 |
| 16. | Net Reproduction Rate(NRR) | 1 |