

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**



**Name of the Faculty: Science & Technology**

**CHOICE BASED CREDIT SYSTEM**

**Syllabus: Statistics**

**Name of the Course: B.Sc. I (Sem.– I & II)**

**(Syllabus to be implemented from June 2022)**

## B.Sc. I Sem. I (Liberal)

### Syllabus for Semester-I

: Statistics (Core Courses and General Electives)

Statistics		
Course	Paper	Credits
Core Courses	Paper I : Descriptive Statistics-I	04
	Paper II : Elementary Probability Theory	
Generic Electives	Paper I: Official Statistics and Demography	04
	Paper II: Index Numbers	

Core Courses	Paper I : Descriptive Statistics-I
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#### Unit – 1

(15 hrs.)

**1.1 Statistical Methods:** Definition and scope of Statistics, concepts of statistical population and sample. Data: primary and secondary data, quantitative and qualitative data, attributes, variables, discrete and continuous variables, scales of measurement - nominal, ordinal, interval and ratio scale. Presentation: tabular and graphical, including histogram and ogives.

**1.2 Attributes:** Notation, dichotomy, class frequency, order of class, positive and negative class frequency, ultimate class frequency, fundamental set of class frequency, relationship among different class frequencies (up to three attributes). Concept of consistency, conditions of consistency (up to three attributes). Concept of independence and association of two attributes. Yule's coefficient of association (Q): Definition, interpretation. Coefficient of colligation (Y): Definition, interpretation. Relation between Q and Y:  $Q = 2Y / (1+Y^2)$ ,  $|Q| \geq |Y|$ . Illustrative examples.

**1.3 Measures of Central Tendency:** Concept of central tendency, average, requirements of good average. **Arithmetic Mean (A.M.):** Definition, Effect of change of origin and scale, Deviation of observations from A.M., Mean of pooled data, Weighted A.M. **Geometric Mean (G.M.):** Definition, G. M. of pooled data (for two groups). **Harmonic Mean (H.M.):** Definition, Relation:  $A.M \geq G.M \geq H.M$  (proof for  $n = 2$ )

positive observations). **Median:** Definition, Derivation of formula for median of grouped frequency distribution. **Mode:** Definition, Derivation of formula for mode of grouped frequency distribution. Empirical relation among mean, median and mode. Graphical methods of determination of Median and Mode. **Partition values:** Quartiles, Deciles and Percentiles. Comparison between averages in accordance with requirements of good average. Situations where one kind of average is preferable to others. Illustrative examples.

## Unit – 2

(15 hrs.)

**2.1 Measures of Dispersion:** Concept of dispersion, Requirements of a good measure of dispersion. Absolute and Relative measures of dispersion, **Range:** Definition, Coefficient of range. **Quartile Deviation (Q. D. or Semi-inter quartile range):** Definition, Coefficient of Q.D. **Mean Deviation (M.D.):** Definition, Coefficient of M.D., Minimal property of M.D. **Mean Square Deviation (M.S.D.):** Definition, Minimal property of M.S.D. **Variance and Standard Deviation (S.D.):** Definition, Effect of change of origin and scale, S.D. of pooled data (proof for two groups). **Coefficient of Variation:** Definition and use. Illustrative Examples.

**2.2 Moments:** Raw moments and central moments for ungrouped and grouped data. Effect of change of origin and scale on central moments, relation between central moments and raw moments (up to 4<sup>th</sup> order). Sheppard's corrections. **Skewness:** Concept of skewness, types of skewness. Bowley's coefficient of skewness, Karl Pearson's coefficient of skewness. Measures of skewness based on moments. **Kurtosis:** Concept of kurtosis, Types of kurtosis. Measures of kurtosis based on moments. Illustrative examples.

## Unit – 1

(15 hrs.)

**1.1 Sample space and events:** Concepts of experiments. Random and non-random experiments, Definitions: Sample space, Discrete sample space (finite and countably infinite), Event, Elementary event, Compound event, Favourable event, Algebra of events (Union, Intersection and Complementation), Definitions of mutually exclusive events, Exhaustive events, Impossible events, Certain event, Power set  $|P(\Omega)$  (sample space consisting at most 3 sample points), Symbolic representation of events, Illustrative examples.

**1.2 Probability:** Equally likely outcomes (events), apriori (classical) definition of probability of an event, Equiprobable sample space, simple examples of computation of probability of the events, Axiomatic definition of probability with reference to a finite and countably infinite sample space. Proof of the results:

i)  $P(\Phi) = 0$ ,

ii)  $P(A^c) = 1 - P(A)$ ,

iii)  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$  (with proof) and its generalization for three events (Statement only),

iv) If  $A \subset B$ ,  $P(A) \leq P(B)$ ,

v)  $0 \leq P(A \cap B) \leq P(A) \leq P(A \cup B) \leq P(A) + P(B)$ .

Definition of probability in terms of odds ratio, Illustrative examples.

## Unit – 2

(15 hrs.)

**2.1 Conditional Probability:** Definition of conditional probability of an event, Multiplication theorem for two events, Examples on conditional probability, Partition of sample space, Idea of posteriori probability, Baye's theorem (Statement and proof), Examples on Baye's theorem.

**2.2 Independence of events:** Concept of independence of two events. Proof of the result that if A and B are independent events, then i) A and  $B^c$  are independent events, ii)

$A^c$  and  $B$  are independent events, iii)  $A^c$  and  $B^c$  are independent events, Pairwise and Mutual Independence for three events, Illustrative examples.

**Books Recommended:**

1. Bhat B. R., Srivenkatramana, T and Madhava K. S. (1996) : Statistics : A Beginner's Text Vol. 1, New Age International (P), Ltd.
2. Goon, Gupta and Dasgupta: Fundamentals of Statistics Vol. I & II, World Press, Calcutta.
3. Gupta S. P : Statistical Methods.
4. Gupta and Kapoor : Applied Statistics.
5. Dixit P. G. and Thigale T. K. : A text book of Statistics Paper - I & II
6. Gupta & Kapoor : Fundamentals of Mathematical statistics.
7. Rohatgi V. K. and Saleh A. K. Md E(2002) : An introduction to probability and statistics , John Wiley and Sons (Asia).
8. Hogg R. V. and Crag R. G. : Introduction to Mathematical Statistics Ed. 4