



**GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND P.G. COURSES (A)**

**DEPARTMENT OF STATISTICS**

**VISAKHAPATNAM**

**I B.Sc. Honours (STATISTICS)**

**w.e.f. AY 2023-24 COURSE STRUCTURE (SEMESTER-I)**

Course	Total Marks	Mid. Sem.	Sem. End		Teaching Hours Per Week	Credits
<b>LANGUAGES, MULTI DISCIPLINARY AND SKILL ENHANCEMENT COURSES (COMMON FOR ALL)</b>						
1. First Language: Telugu/ Hindi/ Sanskrit	100	40	60		4	3
2. Second Language: English	100	40	60		4	3
3. Multi Disney-1: Indian History	50	---	50		2	2
4. Skill Enhancement Course -1 Communication Skills	50	--	50		2	2
5. Skill Enhancement Course -2 Analytical Skills	50	-	50		2	2
<b>TOTAL</b>	<b>350</b>	<b>80</b>	<b>270</b>		<b>14</b>	<b>12</b>
<b>PART II - CORE SUBJECTS MAJOR and MINOR</b>						
<b>B.Sc.</b>						
1. MAJOR-1 Course-1 (i) Essentials and Applications of Mathematical, Physical and Chemical Sciences.	100	40 ( Mid + Activities) (20+20)	60		3	3
Lab / Practical/ Activities	-	-	-		2	1
2. MAJOR-2 Course-2 (i) Advances in Mathematical, Physical and Chemical Sciences.	100	40 ( Mid + Activities) (20+20)	60		3	3
Lab / Practical/ Activities	-	-	-		2	1
<b>TOTAL</b>	<b>200</b>	<b>80</b>	<b>120</b>		<b>10</b>	<b>8</b>
<b>GRAND TOTAL</b>	<b>550</b>	<b>160</b>	<b>390</b>		<b>24</b>	<b>20</b>



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**w.e.f. AY 2023-24 COURSE STRUCTURE (SEMESTER-II)**

Course	Total Marks	Mid. Sem.	Sem. End	Teaching Hours Per Week	Credits
<b>LANGUAGES, MULTI DISCIPLINARY AND SKILL ENHANCEMENT COURSES (COMMON FOR ALL)</b>					
1. First Language: Telugu/ Hindi/ Sanskrit	100	40	60	4	3
2. Second Language: English	100	40	60	4	3
3. Skill Enhancement Food Adulteration	50	--	50	2	2
4. Skill Enhancement Business Writing	50	-	50	2	2
5. Multidisciplinary Indian History	50	-	50	2	2
<b>TOTAL</b>	<b>350</b>	<b>80</b>	<b>270</b>	<b>14</b>	<b>12</b>
<b>PART II - CORE SUBJECTS MAJOR and MINOR</b>					
<b>B.Sc.</b>					
6. MAJOR- Course-3 Descriptive Statistics	100	40	60	3	3
Lab / Practical:	50	25	25	2	1
7. MAJOR Course-4 Random Variables & Mathematical Expectations	100	40	60	3	3
Lab/Practical::	50	25	25	2	1
8. MINOR Course-1 Data Science	100	40	60	3	3
Lab/Practical::	50	25	25	2	1
<b>TOTAL</b>	<b>450</b>	<b>195</b>	<b>255</b>	<b>15</b>	<b>12</b>
<b>GRAND TOTAL</b>	<b>750</b>	<b>180</b>	<b>470</b>	<b>29</b>	<b>24</b>



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**DEPARTMENT OF STATISTICS**

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**SEMESTER -II**

**COURSE 3: DESCRIPTIVE STATISTICS**

**Theory**

**Credits: 3**

**3 hrs/week**

### **I. Learning Outcomes:**

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

1. To acquaint myself with the role of statistics in different fields with special reference to business and economics.
2. To review good practice in presentation and the format most applicable to their own data.
3. To learn the measures of central tendency or averages reduce the data to a single value which is highly useful for making comparative studies.
4. To familiar with the measures of dispersion throw light on reliability of average and control of variability.
5. To deal with the situation where there is uncertainty and to measure that uncertainty by using probability, which is essential in all research areas.

### **II. Syllabus**

#### **Unit – 1: Statistical Description of Data**

**(CO1)**

Origin, history and definitions of Statistics. Importance, Scope and limitations Statistics. Function of Statistics – Collection, Presentation, Analysis and Interpretation. Collection of data - primary and secondary data and its methods. Classification of data – Quantitative, Qualitative, Temporal, Spatial. Presentation of data – Textual, Tabular – essential parts.

#### **Unit – 2: measurement of Scales- Diagrammatic representation of data**

**(CO2)**

Measurement Scales – Nominal, Ordinal, Ratio and Interval. Frequency distribution and types of frequency distributions, forming a frequency distribution. Diagrammatic representation of data – Histogram, Bar, Multiple bar and Pie with simple problems. Graphical representation of data: Histogram, frequency polygon and Ogives with simple problems.

**Unit – 3: Measures of Central Tendency (MCT)****(CO3)**

Arithmetic Mean – properties, methods. Median, Mode, Geometric Mean (GM), Harmonic Mean (HM). Calculation of mean, median, mode, GM and HM for grouped and ungrouped data. Median and Mode through graph. Empirical relation between mean, media and mode. Features of good average.

**Unit – 4: Measures of Dispersion****(CO4)**

Concept and problems – Range, Quartile Deviation, Mean Deviation and Standard Deviation, Variance. Central and Non – Central moments and their interrelationship. Sheppard's correction for moments. Skewness and its methods, kurtosis.

**Unit – 5: Elementary Probability****(CO5)**

Basic Concepts of Probability, random experiments, trial, outcome, sample space, event, mutually exclusive and exhaustive events, equally likely and favourable outcomes. Mathematical, Statistical, axiomatic definitions of probability. Conditional Probability and independence of events, Addition and multiplication theorems of probability for 2 and for n events and simple problems. Boole's inequality, Bayes theorem and its applications in real life problems.

**SEMESTER-II****COURSE 3: DESCRIPTIVE STATISTICS****Practical****Credits: 1****2 hrs/week**

1. Writing a Questionnaire in different situations.
2. Forming a grouped and ungrouped frequency distribution table.
3. Diagrammatic presentation of data – Bar, multiple Bar and Pie.
4. Graphical presentation of data – Histogram, frequency polygon, Ogives.
5. Computation of measures of central tendency – Mean, Median and Mode.
6. Computation of measures of dispersion – Q.D., M.D and S.D.
7. Computation of non-central, central moments,  $\beta_1$  and  $\beta_2$  for ungrouped data.
8. Computation of non-central, central moments,  $\beta_1$  and  $\beta_2$  and Sheppard's corrections for grouped data.
9. Computation of Karl Pearson's and Bowley's Coefficients of Skewness.

**Note:** Training shall be on establishing formulae in Excel cells and deriving 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.

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**DEPARTMENT OF STATISTICS**  
**VISAKHAPATNAM**  
**SEMESTER -II**  
**COURSE 4: RANDOM VARIABLES AND MATHEMATICAL EXPECTATIONS**

**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 yourself with the role of statistics in dealing with the univariate random variables.
2. To learn the extension of the univariate data to bivariate data.
3. To learn the measure of randomness mathematically by using expectations.
4. To get the familiarity about the generating functions, law of large numbers and central limit theorem, further to apply in research and allied fields.

### **II. Syllabus**

#### **Unit – 1: Univariate Random Variables (CO1)**

Definition of random variable (r.v.), discrete and continuous random variables, functions of random variable. Probability mass function, Probability density function, Distribution function and its properties. Calculation of moments, coefficient of skewness and kurtosis for a given pmf and pdf.

#### **Unit – 2: Bivariate Random Variables (CO2)**

Bivariate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables and simple problems.

#### **Unit – 3: Mathematical Expectation (CO3)**

Mathematical expectation of function of a random variable. Moments and covariance using mathematical expectation with examples. Addition and Multiplication theorems on expectation. Properties of expectations, variance, covariance. Chebyshev and Cauchy - Schwarz inequalities and their applications.

**Unit – 4: Generating functions****(CO4)**

Definitions of Moment Generating Function, Cumulant Generating Function, Characteristic Function and Probability Generating Function and their properties. Weak Law of Large Numbers (WLLN), Strong Law of Large Numbers (SLLN).

**Unit – 5: Limit Theorems****(CO5)**

Concept – Population, Sample, Parameter, statistic, Sampling distribution, Standard error. Convergence in probability and convergence in distribution, concept of Central limit theorem. Lindberg – Levy CLT and its applications, Statement of Lyapunov's CLT, relationship between CLT and WLLN.

**SEMESTER-II****COURSE 4: RANDOM VARIABLES AND MATHEMATICAL EXPECTATIONS****Practical****Credits: 1****2 hrs/week****Syllabus**

1. Calculation of moments of univariate random variable to the given pmf.
2. Calculation of coefficient of skewness and kurtosis of univariate random variable to the given pmf.
3. Calculation of moments of univariate random variable to the given pdf.
4. Calculation of coefficient of skewness and kurtosis of univariate random variable to the given pdf.
5. Problems related to jpmf, mpmf and conditional pmf and its independence.
6. Problem related to jpdf, mpdf and conditional pdf and its independence.
7. Chebyshev's inequality application oriented problems.

**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.
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