ANDHRA KESARI UNIVERSITY ::ONGOLE

Model Syllabus for Statistics (Minor) in consonance with Curriculum framework

w.e.f. AY 2025-26

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	III	1	Descriptive Statistics	3	3
			Descriptive Statistics Practical Course	2	1
	IV	2	Theory of Probability and Mathematical Expectations	3	3
			Theory of Probability and Mathematical Expectations Practical Course	2	1
III	V	3	Theoretical Distributions	3	3
			Theoretical Distributions Practical Course	2	1
		4	Statistical Methods	3	3
			Statistical Methods Practical Course	2	1
	VI	5	Inferential Statistics	3	3
			Inferential Statistics Practical Course	2	1
		6	Sampling Techniques and Design of Experiments	3	3
			Sampling Techniques and Design of Experiments Practical Course	2	1

SEMESTER-III

COURSE 1: DESCRIPTIVE STATISTICS

Theory	Credits: 3	3 hrs/week

Program Objectives

1. To build the basis for promoting various statistical methods theoretically and their applications in study of multidisciplinary sciences by emphasizing real life problems.
2. To inculcate statistical thinking and computer approach towards statistical methods, tools and techniques among the students.
3. To develop skills in handling complex problems in data analysis and research design.

Course 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 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.

Unit – 1: Statistical Description of Data

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 Scales – Nominal, Ordinal, Ratio and Interval. Frequency distribution and types of frequency distributions, forming a frequency distribution. Diagrammatic representation of data – Historiagram, 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)

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, median and mode. Features of good average.

Unit – 4: Measures of Dispersion

Concept and problems – Range, Quartile Deviation, Mean Deviation and Standard Deviation and their coefficients, Variance and its applications viz. Business and Pharmacy etc.

Unit – 5:
Central and Non – Central moments and their interrelationship, Problems. Sheppard's correction for moments and problems. Skewness and its methods, kurtosis and related problems.

Text Books

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

References

1. O. P. Gupta: Mathematical Statistics, Kedarnath Ramnath & Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd.

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-III

COURSE 1: DESCRIPTIVE STATISTICS

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

List of Experiments:

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, β_1 and β_2 for ungrouped data.
8. Computation of non-central, central moments, β_1 and β_2 and Sheppard's corrections for grouped data.
9. Computation of Karl Pearson's and Bowley's Coefficients of Skewness.
10. Computation of Kurtosis.

Note: List of experiments are suggested to do in MS – Excel also.

SEMESTER-IV

COURSE 2: THEORY OF PROBABILITY AND MATHEMATICAL EXPECTATIONS

Theory	Credits: 3	3 hrs/week

Course Outcomes

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

1. To acquaint 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 deal with the situation where there is uncertainty and to measure that uncertainty by using the probability, which is essential in all research areas.

Unit – 1: Elementary Probability

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.

Unit – 2: Univariate Random Variables

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 – 3: Bivariate Random Variables

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

Unit – 4: Mathematical Expectation

Mathematical expectation of function 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-Schwartz inequalities and their applications.

Unit – 5: Generating functions

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). Convergence in probability and convergence in distribution, concept of Central limit theorem.

Text Books

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

References

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SEMESTER-IV

COURSE 2: THEORY OF PROBABILITY AND MATHEMATICAL EXPECTATIONS

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

List of Experiments:

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. Problem 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.

Note: List of experiments are suggested to do in MS – Excel also.

SEMESTER-V

COURSE 3: THEORETICAL DISTRIBUTIONS

Theory	Credits: 3	3 hrs/week

Course Outcomes

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

1. To deal with the data by the basic discrete distributions.
2. To deal with the data by the basic continuous distribution.
3. To get familiarity of the most important distributions such as Normal and Standard Normal distribution and their applications in research and various fields.
4.

Unit – 1: Binomial distribution and Poisson Distribution

Binomial distribution – Definition, moments, M.G.F, C.F additive property if exists, skewness, kurtosis and problems. First two moments obtained through mgf, recurrence relation for probabilities, limiting case of Binomial Distribution to Normal distribution. Poisson distribution - Definition, moments, M.G.F, C.F, additive property if exists, skewness, kurtosis and problems. First two moments obtained through mgf, recurrence relation for probabilities. Poisson distribution as a limiting case of Binomial distribution, limiting case of Poisson Distribution to Normal distribution.

Unit – 2: Negative Binomial, Geometric and Hyper Geometric Distribution

Mean, Variance and Mgf of NBD, GD and HGD.

Unit – 3: Continuous distributions

Uniform distribution – Definition, moments, M.G.F, C.F and Distribution function. Exponential distribution – Definition, moments, M.G.F, C.F and Distribution function. Memory less property.

Unit – 4: Gamma and Beta Distributions

Gamma Distribution - Definition, moments, M.G.F, C.F, skewness, kurtosis and additive property. Limiting form of Gamma distribution. Beta Distribution of first and second kind – Definition, mean, variance and harmonic mean.

Unit – 5: Normal Distribution

Normal Distribution – Definition, properties, M.G.F, C.F, additive property, skewness, kurtosis and problems. Obtain mean, median and mode, Even and Odd order moments about mean. Standard Normal Distribution – Definition, mgf, mean and variance, Area property, problems.