M. G. Science Institute, Ahmedabad

Autonomous | Affiliated to Gujarat University, Ahmedabad

(Managed by The Ahmedabad Education Society)

Department of Statistics

Bachelor of Science (Hons.) in Statistics

B.Sc. (Hons.) Statistics

4 Year, 8 Semester Full-Time Programme

Choice Based Credit System (CBCS) & Grading System

Outcome-Based Education Pattern

(Effective from Academic Year 2024-25)

Detailed Syllabus for Each Course B.Sc. (Hons.) Statistics

Semester: IV	Course Title: Correlation and Regression	Credit: 4
Course No.: STM242		Hours: 4/week

Course Outcomes: On successful completion of the course the learner will be able to

CO	COGNITIVE ABILITIES	COURSE OUTCOMES
CO 1	REMEMBERING	Recall the basic definitions, formulas, and concepts of correlation, regression, and curve fitting.
CO 2	UNDERSTANDING	Understand the methods of calculating simple, multiple, and partial correlation coefficients and their interpretations.
CO 3	APPLYING	Apply the principles of curve fitting and regression analysis to model the relationship between variables in real-world datasets.
CO 4	ANALYSING	Analyze the datasets to evaluate the strength and nature of relationships using correlation and regression techniques.
CO 5	EVALUATING	Evaluate the regression model and validate the assumptions underlying correlation and regression.
CO 6	CREATING	Create predictive models using simple, multiple, and partial regression techniques to solve complex problems.

CO-PO Mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	1		1	
CO 2	3	2	1	2	1
CO 3	3	3	2	3	2
CO 4	3	3	3	3	2
CO 5	3	2	3	3	3
CO 6	3	3	3	3	3

Unit	Detailed Syllabus	No. of Hours of Teaching
I	**Correlation** Bivariate data, Scatter diagram, and interpretation. Concept of correlation between two variables, positive correlation, negative correlation, no correlation. Covariance between two variables: Definition, computation, effect of change of origin, and scale. Karl Pearson's coefficient of correlation and its properties. Computation for ungrouped data and grouped frequency distributed data with interpretation. Correlation Ratio, Spearman's rank correlation coefficient, Kendall's Tau.	15
II	**Curve Fitting and Regression** Fitting of Straight line. ($Y = a + bX$) Fitting of second-degree curve ($Y = a + bX + cX^2$), Fitting of exponential and power curves of the type $Y = ae^{bx}$, $Y = ab^x$ and $Y = aX^b$. In all these curves, parameters are estimated by the method of least squares.	15

	Meaning of regression, the difference between correlation and regression. Simple linear regression model. Estimation of unknown constants by the method of least squares. Interpretation of parameters. Concept of coefficient of determination.	
III	**Multiple Correlation and Regression.** Concept of multivariate distribution, Yule's notation, interpretation of primary and secondary suffixes for three variables. Properties of residue X1.23. Derivation of equation for the plane of regression of x1 on x2 and x3, hence deduce the same for x2 on x1 and x3; & x3 on x1 and x2. Derivation of formula for multiple correlation coefficient $R^2_{1.23}$. concept of coefficient of determination. Derivation of formula for Variance of residue $\sigma^2_{1.23}$, hence deduce it for $\sigma^2_{2.13}$ and $\sigma^2_{3.12}$	15
IV	**Partial Correlation and Regression** Derivation for the Partial Regression equation for x1 on x2 when the effect of x3 is constant, hence deduce it for x2 on x3 when the effect of x1 is constant and also other possible partial regression equations. Derivation of formula for Partial correlation coefficient r12.3, r13.2, r3.12 Properties of the partial regression coefficient, the relation between multiple and partial correlation coefficient,	15

Suggested Reference Books:

1. Gupta, S. C. And Kapoor, V. K. (2005): Fundamentals of Applied Statistics, Sultan Chand & Sons.
2. Mukhopadhyay P. (1999): Applied Statistics
3. Gupta, S. C. (2005): Business Statistics, Himalaya Publishing House.