

Mathematics and Statistics for Economics

Level: Bachelor of Arts

Full Marks: 100

Year: I

Pass Marks: 40

Code: Econ. 422

Teaching Hours: 150

Course Objectives

After the completion of this course, student will be familiarize with basic skills of Mathematics and Statistics so that they will be able to understand and explain quantitative aspects of economic theories. The course will lay foundation for understanding concepts of Mathematical and Statistical methods required for advance study in Economics.

Group - A: Mathematics		Hrs.
Unit - I Review of Fundamentals	Sets, Vectors, Real Number system, Relation and Functions, Limit & Continuity, Logarithms, Permutation and Combination	15
Unit - II Differntiation	Differentiation of function with single variable: Rules of differentiation, Higher order derivatives, Differentiation of function with two or more variables: Partial derivatives, Total differentials, Total derivatives, Homogenous function, and Euler's theorem. Maxima and Minima of a function with one and two variables Economic Applications: Marginal Utility, Marginal revenue, Marginal cost, Elasticity, Partial elasticity, Revenue and Profit Maximization	20
Unit - III Integration and Dynamic Analysis	Indefinite Integrals: Nature of integrals, Basic rules of integration, Rules of operation, Rules involving substitution, Definite integrals, Definite integral as an area under the curve, Economic Applications: Calculation of TR, TU, and TC from MR, MU, and MC, Consumer's and Producer's surplus, First order difference and differential equation with constant coefficient and constant term.	20
Unit - IV Linear Algebra	Matrices: Meaning and types of matrices, Matrix operation: Addition, Subtraction, Multiplication, Transpose of a matrix Determinants: Meaning of determinants, Properties of determinants Rank of a matrix, Inverse of a matrix, Solution of linear equation system up to 3 variables, Cramer's rule.	20
Group - B: Statistics		
Unit - V Review of Central Tendency and Measure of Dispersion	Review of Central Tendency: AM, Median, Mode, HM, GM, Weighted mean, Measure of Dispersion: Range, Mean deviation, Standard deviation, Variance, Coefficient of variation, Lorenz curve, Gini-coefficient, Concept of moments, Kurtosis, Skewness and their measurement by using moments.	10
Unit - VI Probability and Probability Distribution	Basic concept of probability and probability distribution: Concept of probability, Addition and multiplication theorems, Conditional probability, Bayes theorem. Random Variable: Expected value, Discrete probability distribution and continuous density function of single random variable, Mean and Variance. Probability Distribution: Binomial distribution and Normal distribution.	18

Unit – VII Correlation and Regression Analysis	Correlation Analysis: Correlation and causation. Types of correlation: positive, negative, partial, multiple measurement of correlation coefficient, Scatter diagram, Karl Pearson's coefficient of correlation, Spearman's rank correlation. Correlation coefficient of bivariate frequency table. Regression Analysis: Meaning, Difference between correlation and regression, Simple linear regression model, Least square method, Two lines of regression (Y on X and X on Y).	20
Unit – VIII Analysis of Time Series	Meaning and importance of time series, Components of time series, Measurement of Trend: Graphic method, Semi - average method, Moving average method, Least square method.	10
Unit - IX Index Numbers	Meaning, Characteristics, Importance, Uses and Classification of Index Numbers. Types of Index Numbers: Price, Quantity and Value Index Numbers. Special Purpose Indices: Cost of living index, Wholesale price index, Consumer price index. Properties of good index number, Problems in constructing index numbers.	10
Unit - X Official Statistics and Computer Applications	Official statistics and various publications from MoF, NRB, NPC and CBS etc. Use of Computers: Data tabulation and graphic presentation of data (Students are encouraged to interpret relevant published data using Excel).	7

References

- Chiang A. and Wainwright, K. (2005). *Fundamental Methods of Mathematical Economics*. 4th ed. New York: McGraw Hill.
- Hoy, M., Livernois J., McKenna C., Rees R. and Stengos, T., (2011). *Mathematics for Economics*, 3rd ed. Massachusetts: MIT Press.
- Gupta, S. (2014). *Statistical Methods*. 43rd ed. New Delhi: Sultan Chand and Sons.
- Lind, D. A., Garchal, W. G., and Wathen, S. A., (2006). *Basic Statistics for Business and Economics*. 5th ed. New York: McGraw Hill.
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- Lipschutz, S. and Lipson, M. (2011). *Schaum's Outline of Theory and Problems of Probability*. New York: McGraw Hill Professional.
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- Yamane, T. (1968). *Mathematics for Economists; An Elementary Survey*. 2nd ed. New Delhi.: Prentice-Hall.

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