Course Code: CAL-112

Title: Calculus-I
Credit Hours: 03
Prerequisite: Mathematics at Secondary Level

Course Objectives:

To prepare the students with the essential tools of algebra/calculus to apply the concepts and the situations in Economics.

Course Contents

Preliminaries

Demystifying Mathematics and Mathematical Economics, Mathematics vs. Non-Mathematical Economics, Mathematical Economics versus Econometrics. Ingredients of a Mathematical Model: Variables and Economic Variables, Constants and Parameters. A Few Aspects of Logic: Proportions, Implications and Necessary and Sufficient Conditions. The Real-Number System. Use of Sets in Economics. Cartesian Coordinates.

Functions and Equations:

Functions, Domain and Range, Relations. Schultz Demand Function, Laffer Curve. Population and Consumption Functions, Quadratic Cost Function and Profit Function of a Monopoly, Quadratic Production Possibilities Frontier, Cubic Cost Functions, Rectangular Hyperbolic Functions, Population Growth using General Exponential Functions, Population Growth using Natural Exponential Functions, Equations and Identities, Definitional, Behavioral and Conditional Equations with Economic examples. Structural and Reduced Form Equations. Partial Linear Market Equilibrium and effects of Tax, shifts in Demand and supply curves. A Nonlinear Model, Numerical Solution of Two Good Case. National Income Equilibrium, extension of Induced and Autonomous Tax, Proportion of Government Expenditure.

Matrices

Matrices and Vectors, Matrix Operations. Commutative, Associative and Distributive Laws. Vector Operations, Transpose, Cofactors, Adjoint, Determinant of a Matrix, Inverse of a Matrix, Minors and Cofactors. Market Model Analysis using Matrix Inversion Method. National Income Analysis using Matrix Inversion Method. Market Model and National Income Determination using Cramer's Rule.

Homogeneous Functions

Homogeneous Functions, Homogeneity of CES Production Function, Cobb-Douglas Production Function and Returns to Scale. Expansion Path using First Order Condition. Homothetic Functions, Homotheticity of Cobb-Douglas Production Function.

Differentiation

The Need and Nature of Comparative Statics, Concept of Limit and Continuity, Rate of Change, Slope & Derivative, Differentiation Rules for Single Variable Functions: Constant Function Rule & Power Function Rule, Sum-Difference Rule of Differentiation, Numerical Analysis of Cost Function, Product Rule of Differentiation, Quotient Rule of Differentiation, Marginal Cost, Marginal Revenue and Marginal Product Analysis. Chain Rule and Marginal Revenue Product of Labor (MRPL) Analysis.

Recommended Books:

- Budnick, Frank, Applied Mathematics for Business, Economics and Social Sciences. - Latest Edition.
- Chiang A.C. Fundamental Methods of Mathematical Economics McGraw Hill –Latest Edition.
- Dowling Edward T. Mathematics for Economics Schaum Series, Latest Edition.
- Weber E. Jean, Mathematical Analysis, Business and Economic Application (latest edition), Harper and Row Publishers, New York.