4. MATHEMATICAL METHODS FOR ECONOMICS

Course Objective: This course is to provide basic understanding about mathematical methods relevant to economics and skills to apply them in understanding various economic issues.

Course Learning Outcomes:

After studying this course, the student shall be able to achieve the following outcomes:

CO1: Explain the basics of sets, functions and their graphical representation

CO2: Learn the rules of differentiation and apply the same to economic problems

CO3: Learn and use maxima and minima to Optimization problems in economics

CO4: Apply rules of integration to estimate the size of consumers' and producers' surplus

CO5: Solve the economic problems through the application of the Matrix Theory

Unit 1: Sets & Functions
- Role of Mathematical Methods in Economics
- Sets: Types, Operations
- Functions: Meaning, Types, Graphical Representation, Applications in Economics.

Unit 2: Differential Calculus
- Limits of Functions; Continuity and Differentiability of a Function
- Derivative of a Function; Rules of Differentiation
- First and Second Derivatives and their Interpretations; Partial Derivatives
- Applications of Derivatives in Economics

Unit 3: Optimization Problems and their Applications
- Concept of Optimization in mathematics; Problems of Maxima and Minima
- Unconstrained & Constrained Optimization
- The Method of Lagrange Multipliers
- Some Applications of Optimization in Economics

Unit 4: Integrations and Linear Programming
- Concept of integration; Simple Rules of Integration
- Application of Integrations in Economics
- Linear Programming: Basic Concept, Formulation of Problem; Feasible, Basic and Optimal Solutions
- Applications of Liner Programming in Economics.

Unit 5: Matrices and Determinants and Applications in Economics
- Matrix: Concept, Types; Matrix Operations: Addition, Multiplication

- Determinants, Inverse of a Matrix
- Solution to the System of Simultaneous Equations, Cramer's Rule
- Some Applications of Matrix Theory in Economics

References:

1. Alien, R.G.D. (1974), *Mathematical Analysis for Economists*, Macmillan Press and ELBS, London.
2. Chiang, A.C. (1986), *Fundamental Methods of Mathematical Economics*, McGraw Hill, New York.
3. Yamane, Taro (1975), *Mathematics for Economists*, Prentice Hall of India New Delhi.
4. Heijdra, B.J. and V.P. Fredericck (2001), *Foundations of Modern Macroeconomics*, Oxford University Press, New Delhi.
5. Knut *Sydsaeter* and Peter *Hammond* (2008), *Mathematics for Economic Analysis*. Pearson education.
6. Open Source Online Materials & Videos: IGNOU, e-PG Pathasala, SWAYM, Khan Academy etc.

Suggested Activities:

Unit-1: Assignments on solving sets and modeling various functions

Unit-2: Exercises on solving differential equation and their application in economics

Unit-3: Board Presentation by students in solving the optimization problems related to economics

Unit-4: Task Based Learning (TBL) for solving and application of the liner program models with economic examples

Unit-5: Group Projects on solving matric problems, submit report and make presentation.