Semester VI
ECODSC – 352
Mathematical Economics
Total Credit: 4
Contact Hours: 45 hours

Course Objectives:
To introduce mathematical concepts used in economics, apply these tools in economic analysis, solve optimization problems, and analyze strategic behavior using game theory and linear programming.

Course Outcomes:
Students will develop skills to interpret economic models, solve optimization problems, and apply game theory and linear programming.

Unit 1: Basic Mathematical Concepts in Economics
Introduction to Mathematical Economics: Definition and scope, Why use mathematics in economics. Economic Models: Economic theory vs. mathematical models, Functions and graphs: Definition and types of functions (linear, quadratic, polynomial, etc.), Graphical representation of economic relationship.

Unit 2: Functions of One and Two Variables
Demand and Supply Functions: Mathematical representation of demand and supply, Shifts vs. movement along the curves. Revenue, Cost, and Profit Functions: Total revenue (TR), total cost (TC), and profit (π), Marginal revenue and marginal cost concepts, Elasticity and Its Applications: Price elasticity of demand and supply, Cross-price and income elasticity in market analysis

Unit 3: Optimization Techniques in Economics
Optimization in Consumer Behavior: Utility maximization, Firm Behavior and Cost Minimization: Cost minimization, Profit Maximization and Market Structures: Applications of profit maximization in perfect competition and monopoly

Unit 4: Linear Programming Problem (LPP) and Input-Output Analysis
Economic applications of LPP: Profit maximization, cost minimization, resource allocation, Duality in LPP and its economic interpretation. Application of input-output analysis in economic planning and inter-industry relationships

Unit 5: Game Theory and Strategic Behavior
Basic concepts: Pay-off matrix, value of game, Zero and non-zero sum game, Game theory in oligopoly markets: Prisoner's dilemma and other classic games, application of game theories in economics.

Suggested Readings:

1. Chiang, A. C., & Wainwright, K. (2005). Fundamental methods of mathematical economics (4th ed.). McGraw-Hill.
2. Mehta, B. C., &Madnani, C. M. H. (1979). Mathematics for economists. Sultan Chand and Sons.
3. Nicholson, W., & Snyder, C. (2014). *Microeconomic theory: Basic principles and extensions* (11th ed.). Cengage Learning.
4. Osborne, M. J. (2004). *An introduction to game theory*. Oxford University Press.

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5. Varian, H. R. (2014). *Intermediate microeconomics: A modern approach* (9th ed.). W.W. Norton & Company.

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