Jamia Millia Islamia
Department of Economics
Four Years Under-Graduate (FYUG) programme
(w.e.f. 2024-25)

Title: Mathematical Methods for Economics-I	
Type of course: Major	**Code:** 24-ECO-C-101
Semester: I	**Credits:** 4

I. <u>Overview:</u> For the strong foundation of economic modeling at under graduate level, the basic knowledge of Mathematics is essential. Therefore, this course provides an extensive and through use of mathematical concepts. In this direction students are expected to gain the knowledge of the concepts of set theory, functions and graphs, limits, continuity and single variable differential calculus, single variable optimization and integral calculus. This course has been designed keeping in mind the aforesaid need of the students. The main focus will be on understanding how the mathematical tools can be used to analyze the economic problems.

II. <u>Objectives:</u>

1. To enhance the mathematical skills essential to study economics.
2. To identify, solve and interpret the economic results mathematically.
3. To understand and create economic models.
4. To explore the techniques to solve complex problems of economics.

III. <u>Learning Outcomes:</u> At the end of the course, students are expected,

1. To advance the mathematical skills necessary to study Economics.
2. To know the basic concept of mathematics used in Economics.
3. To understand the analytical skills required for solving problems in economics.
4. To apply the various tools of mathematics in Economics.
5. To evaluate the economic policy quantitatively.

IV. <u>Course Contents</u>
Unit -1: **Basic concepts, Functions and Graphs**

➢ Sets and set operations, Ordered pairs, the real numbers, natural numbers, integers, rational and irrational numbers; absolute value and intervals; inequalities.

➢ The general concept of function, types of function (linear, quadratic, power, exponential, inverse); graphs of functions; Applications in Economics

Unit-2: Limits, Continuity and Single variable Differential Calculus

➢ Limits, continuity and differentiability, rules of differentiation (simple differentiation, sums, products, and quotients); Second and higher order derivatives, power rule, chain rule, implicit differentiation; Linear approximation and differentials; Quadratic approximations, Elasticities the Intermediate-value Theorem; the Extreme-value Theorem; The Mean-value Theorem; Indeterminate forms and L'Hopital's rule; Applications in Economic

Unit-3: Single variable optimization and Integral Calculus

➢ Stationary points of a function, Maxima and Minima (local and global); Convexity and Concavity of functions; Points of inflection; Optimization of economic functions
Rules of integration, integration by parts, integration by substitution, indefinite integral, Definite Integral, Proper and Improper integral; Areas under curves and economic application of integration.

V. References:

1. Knut Sydsaeter and Peter J. Hammond (2005), *Mathematics for Economic Analysis*. Pearson Educational Asia: Delhi, 4th Indian reprint.
2. Chiang, A. C. & Kevin Wainwright (2005) (Fourth Edition): Fundamental Methods of Mathematical Economics, McGraw-Hill.
3. Allen, R.G.D.(1974), Mathematical Analysis for Economists, McMillan press, London
4. Chiang, A. C. (1984), *Fundamental Methods of Mathematical Economics, 3rd Ed*, McGraw-Hill.
5. Hoy,M., J. Livernois, C. McKenna, R. Rees and T. Stengos(2001), Mathematics for Economics, 2nd Edition Prentice Hall, India.
6. Dowling, Edward T. (1992), Schaum's Outline of Theory and Problems of Introduction to Mathematical Economics, 3rd Edition, McGraw Hill.
7. Rosser, Mike. (2003). Basic Mathematics for Economists, Second Edition, Routledge, Taylor & Francis Group
8. Handerson, Quandt. (1980). Microeconomic Theory, A Mathematical Approach, Third Edition, McGraw Hill.

VI. Evaluation:

Internal tests	Assignment (25 marks)
University examination	Written unseen test in the usual pattern (one 20 mark question from each unit and 15 mark from all units, 75 marks in total)

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