

UNIVERSITY OF MADRAS
M.A. DEGREE PROGRAMME IN ECONOMICS
SYLLABUS WITH EFFECT FROM 2023-2024

401C2C

SEMESTER – II - CORE – VI

MATHEMATICAL ECONOMICS

Course Objectives:

1. The paper aims to introduce students to the basic building blocks of mathematical analysis used in modern economic theory.
2. To equip the students with mathematical tools and to optimize both static and dynamic economic environment.

Unit I: Introduction to Linear Algebra

Sets-Basic concepts-Ordered sets-Relations-Order relations-Metric Spaces-open and closed sets–Convergence - Linear Algebra , Vectors, matrices, inverse, simultaneous linear equations, Cramer’s rule for solving system of linear equations, input-output model, Hawkins - Simon condition, open and closed models , quadratic equation, characteristic (eigen) roots and vectors

Unit II: Differential Calculus

Introduction to Functions, Limits and Continuity, Derivatives –Concept of maxima & minima, elasticity and point of inflection. Profit & revenue maximization under perfect competition, under monopoly. Maximizing excise tax revenue in monopolistic competitive market, Minimization of cost etc.

Unit III: Optimization Techniques with Constraints

Functions of several variables, Partial and total, economic applications, implicit function theorem, higher order derivatives and Young’s theorem, properties of linear homogenous functions, Euler's theorem, Cobb – Douglas Production Function - Constrained Optimization- Lagrangian Multiplier Technique- Vector and Matrix Differentiation -Jacobian and Hessian Matrices- Applications-Utility maximization, Profit maximization and Cost minimization.

Unit IV: Linear and Non-Linear Programming

Optimization with Inequality Constraints- Linear Programming–Formulation-Primal and Dual- Graphical and Simplex method-Duality Theorem-Non-Linear Programming-Kuhn-Tucker Conditions- Economic Applications.

Unit V: Economic Dynamics

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Differential Equations-Basic Ideas-Types-Solution of Differential Equations (Homogenous and Exact)-Linear Differential Equations with Constant Coefficients (First and Second Order)-Applications- Solow’s Model-Harrod-Domar Model-Applications to Market models- Difference Equations - Types-Linear Difference Equations with Constant Coefficients (First and Second order) and solutions – Applications- Samuelson’s Accelerator-Multiplier model-Cobweb model.

Textbooks:

1. Geoff Renshaw,(2016)Maths for Economics, 4E Oxford University Press.
2. Mabbet A J(1986) Workout Mathematics for Economists, Macmillan Master Series, 4th Edition London.

References:

1. Carter, M. (2001). Foundations of Mathematical Economics, MIT Press.
2. Chiang, A. C. and Wainwright, K. (2005). Fundamental Methods of Mathematical Economics, McGraw-Hill Education.
3. Dowling E. T., Mathematics for economists, Schaum Series (latest edition).

Web Resources

1. <https://www.udemy.com/course/mathematics-for-economists-functions-and-derivatives/>
2. <https://www.classcentral.com/course/swayam-mathematical-economics-14187>
3. <https://www.coursera.org/learn/introduction-to-calculus>

Course Outcomes (Cos):

Upon Completion of this course, the students will be able to

No.	Course Outcomes	K-Levels
CO1	Understand the mathematical structure of standard economic theoretical framework	K1, K2, K4
CO2	Equip students with mathematical tools to solve optimization problems appear in economic theory	K2, K4, K5
CO3	Equip students with tools to read the technical writing appear in standard economic journals	K1, K3, K4
CO4	analyse the dynamics of macroeconomic policies in an economy	K1, K2, K4
CO5	analyse mathematically the dynamics of the growth process in an economy	K3, K2,K5

K1 – Knowledge, K2 - Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, K6 – Create.

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CO-PO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3	3	3	3	3

Level of Correlation between PSO's and CO's

(Suggested by UGC as per Six Sigma Tool – Cause and Effect Matrix)

Assign the value

1 – Low

2 – Medium

3 – High

0 – No Correlation