

PAPER CODE: MES-C-103
MATHEMATICS

Unit I – Functions and Calculus

- One-Variable Calculus: Functions on \mathbb{R}^1 , Linear Functions, Non-linear Functions, Graphing of Functions, Convexity, Maxima and Minima, Composite Functions and Chain Rule, Inverse Functions, Exponential and Logarithmic Functions.
- Several-Variable Calculus: Limits and Open Sets, Functions of Several Variables, Total Derivative, Directional Derivatives and Gradients, Explicit Functions, Implicit Functions.
- Optimization: Constrained and Unconstrained Optimization, Homogeneous and Homothetic Functions, Concave and Quasi-concave Functions.
- Economic Applications

Unit II – Linear Algebra

- System of Linear of Equations: Gaussian and Gauss-Jordan Elimination, Row Operations, Rank of a Matrix, Matrix Algebra, Square Matrix, Input-Output Matrices, Determinants.
- Euclidean Spaces: Points and Vectors in Euclidean Space, Algebra of Vectors, Lines and Planes.
- Linear Independence: Spanning Sets, Basis and Dimension in \mathbb{R}^n .
- Economic Applications

Unit III – Eigenvalues and Dynamics

- Eigenvalues and Eigenvectors: Linear Difference Equations, Properties of Eigenvalues, Repeated Eigenvalues, Complex Eigenvalues and Eigenvectors, Markov Processes, Definiteness of Quadratic Forms
- Differential Equations: First and Second Order Differential Equations, Phase Portraits, Planar Systems, Steady State and Stability, First Integrals
- Economic Applications

Reading List:

- Hoy, M., J. Livernois, C. McKenna, R. Rees and T. Stengos (2001), Mathematics for Economics, 2nd Ed. MIT Press.
- Simon, Carl P. and Blume, Lawrence (1994), Mathematics for Economists, First Edition, 1994, W.W. Norton and Company.
- A.C. Chiang and Kevin Wainwright (2005), Fundamental Methods of Mathematical Economics, McGraw-Hill.
- Chiang, A.C. (1984), Fundamental Methods of Mathematical Economics, 3rd Edition, McGraw-Hill.
- Allen, R.G.D. (1974), Mathematical Analysis for Economists, Macmillan Press, London.
- Sydsaeter, Knut, Peter Hammond (2002), Essential Mathematics for Economic Analysis, Prentice Hall.
- Dixit, A.K. (1990), Optimization in Economic Theory, 2nd Edition, Oxford University Press.
- Dowling, Edward T. (2004), Introduction to Mathematical Economics, 3rd Ed. McGraw-Hill.
- M.W. Klein (2002), Mathematical Methods for Economics, 2nd Ed. Addison-Wesley.
- Pemberton M. and N. Rau (2001), Mathematics for Economists, Manchester University Press.


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