CORE-4: MATHEMATICAL METHODS FOR ECONOMICS II

Course Description
This course is the second part of a compulsory two-course sequence. This part is to be taught in Semester II following the first part in Semester I. The objective of this sequence is to transmit the body of basic mathematics that enables the study of economic theory at the undergraduate level, specifically the courses on microeconomic theory, macroeconomic theory, statistics and econometrics set out in this Syllabus. In this course, particular economic models are not the ends, but the means for illustrating the method of applying mathematical techniques to economic theory in general. The level of sophistication at which the material is to be taught is indicated by the contents of the prescribed textbook.

Module I: **Linear models:**
Input- Output Model: Basic concepts and structure of Leontief's open and static Input-Output model; solution for equilibrium output in a three industry model; The closed model

Module II: Second and higher order derivatives:
Technique of higher order differentiation; Interpretation of second derivative; Second order derivative and curvature of a function; Concavity and convexity of functions; Points of inflection

Module III: **Differentials and total derivatives:**
Differentials and derivatives; Total differentials; Rules of differentials; Total derivatives; Derivatives of implicit functions

Module IV: Single and multivariable optimisation:
Optimum values and extreme values; Relative maximum and minimum; Necessary versus sufficient conditions - First and Second derivative tests; Economic applications thereof, First and second order condition for extremum of multivariable functions; Convex functions and convex sets

Module V: Optimisation with Equality Constraints:
Effects of a constraint; Finding stationary value – Lagrange-Multiplier method (Two variable single constraint case only): First and second order condition; The Bordered Hessian determinant.

Readings:
1. K. Sydsaeter and P. J. Hammond (2002): *Mathematics for Economic Analysis.* Pearson Educational Asia
2. *A. C. Chiang and K. Wainwright (2005): Fundamental Methods of Mathematical Economics*, McGraw Hill International Edition.
3. T. Yamane (2012): *Mathematics for Economists*, Prentice-Hall of India