

**Course Name:** Mathematical Methods of Economics

**Course No.:** IE 404

**Course Instructor:** Dr. Bharatee Bhusana Dash

**Course Credit:** 4 (Tue/Fri 11:30 AM to 1:00 PM)

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**Contact Hours:** Thursday (4:00 to 5:00 PM)

This course provides a formal exposure to mathematical concepts and tools used in Economics, aiming to train and equip students to pursue studies in different fields of economics where mathematics may be useful and handy.

### **Course outline**

**A. Real Analysis** -- Introduction to set theory; the real number system, closed and open sets, bounded sets, compact sets, convex set; sequences; functions, limit and continuity; concavity, convexity, quasiconcavity, quasiconcavity; mean value theorems; fixed point theorem

**B. Linear Algebra** -- Matrices and vectors; subspaces; systems of equations; eigenvalues and eigenvectors; quadratic forms

**C. Static Optimization** -- Optimization without constraints, optimization with equality constraints, optimization with inequality constraints, the Kuhn-Tucker Theorem; comparative statics – Envelope theorems

**D. Exponential & Logarithmic Functions** – Nature of exponential functions; natural exponential function and the problem of growth; logarithms; logarithmic functions; derivatives of exponential and log functions; Optimal timing; some applications

**E. Economic Dynamics & Integral Analysis** – Dynamics and integration; indefinite integrals; definite integrals; improper integrals; some applications; Domar growth model

**F. Differential equations** – ordinary differential equations of the first order – basic concepts, solving some simple types of equations; higher order differential equations with constant coefficient; homogeneous and nonhomogeneous equations; Exact Differential Equations; some applications; Discrete time and continuous time differential equations; phase diagrams

**G. Difference Equations** – Difference equations – basic concepts; linear first order and higher order equations with constant coefficients; Analysis of stability of equilibria in two dimensional systems; extension to n-dimensional systems.

**Reading list:** You can refer to any graduate level textbook for this topic. A few recommended books are:

**Mathematics for Economists** by Carl P. Simon and Lawrence Blume, Viva Books, 2006.

**Mathematical Analysis** by Binmore, K. (1999), Cambridge University Press (Only for Topic I)

**Mathematics for Economics** by Hoy, Livernois, McKenna, Rees & Stegnos, MIT Press

**Evaluation:** Evaluation of students will be based on a mid-semester (50%) and finalexamination (50%).