MTH 204: Basic Mathematics

(BIM)

Credits: 3
Lecture Hours:48

Course Objectives

The purpose of this basic mathematics course is to increase students' mathematical knowledge and skill required to understand management, IT and computing courses as it applies to many aspects of business and to help make them a more valuable player in the business arena.

Course contents

Numbers and their properties. Introduction to complex numbers, Concepts of Functions, Limits and Continuity. Differentiation and Its Application in business and economics. Concepts of integration and its application. Differential Equations. Concept of vectors and matrices. Method of least square.

Course Details

Unit 1: Set Theory and Real Number System **6 LHs**

Concept, notation and specification of sets, Types of sets, Relation between sets, Venn diagrams, Operations on sets. Laws of algebra of sets (without proof), Number of elements in a set and the problems relating up to three sets. Sets of numbers (Natural numbers, Integers, Rational numbers, Irrational numbers, Real numbers), Representation of real numbers on the real line. Properties (addition multiplication, cancellation, distributive, order) of real numbers (without proof), Inequalities and their properties. Intervals, Modulus of a real number and its properties.

Unit 2: Complex Numbers **4 LHs**

Definition of a complex number, Integral powers of i, Algebra of complex numbers (sum, difference, multiplication, division), Properties of complex numbers, Conjugate of a complex number and its properties, Modulus of a complex number and its properties, Representation of a complex number by a point in a plane (Argand's diagram), Polar representation of a complex number, Square roots of a complex number, De-Moivre's theorem (statement only) and its application to find up to cube roots of a complex number.

Unit 3: Functions, Limits and Continuity **6 LHs**

Constant and variable, Concept of functions, Types of functions, Graphic representation of algebraic, logarithmic and exponential functions, Computation of functional values, Domain and range of a function. Application of functions to business and economics. Idea of a limit, Limit of a function at a particular point and at infinity, Properties of limits (without proof) and use in evaluating limits involving algebraic functions. Concept of continuity and discontinuity, Test of continuity and discontinuity for simple algebraic functions.

Unit 4: Differentiation and Its Application **8LHs**

Average rate of change, Definition of derivative, Derivative as a slope of tangent to the curve, Differentiation by the first principle of algebraic, logarithmic and exponential functions, Methods of differentiation (power rule, sum rule, product rule, quotient rule chain rule), Differentiation of implicit and parametric functions, Increasing and decreasing function, Stationary point, Point of inflection, Higher order derivatives (up to 3rd order). Economic applications of derivatives for maximum and minimum points.

Unit 5: Integration and Its Application **6 LHs**

Concept of integration, Techniques of integration (Standard forms, Substitution method, Integration by parts), Integration of algebraic, logarithmic and exponential functions. Definite integral, Methods of evaluating definite integrals, Area under a curve, Application of integration in business and economics (including consumer's surplus and producer's surplus).

Unit 6: Differential Equations **5 LHs**

Introduction to differential equation, Order and degree of a differential equation, Solution of a differential equation, General and particular solutions. Equations of the first order and first degree: a) variables separated from b) homogeneous equations c) linear equations (without involving trigonometric functions).

Unit 7: Vectors **5 LHs**

Definition of a vector in a plane and space, Directed line segment, Magnitude of a vector, Types of vectors, Multiplication of a vector by a scalar, Addition of vectors, Parallelogram law of addition of vectors, Collinear and coplanar vectors, Linearly dependent and independent vectors, Scalar product of two vectors, Orthogonal vectors, Vector product of two vectors. Numerical Exercises

Unit 8: Matrices and Determinants **6 LHs**

Introduction of matrices, Types of matrices, Equality of matrices, Algebra of matrices, Transpose of a matrix. Determinant of a Square matrix, Minors and cofactors of matrix, Singular and non-singular matrix, Adjoint and inverse of matrices. Solution of a system of linear equations up to three variables (Cramer's rule, Inverse matrix method, Gaussian elimination method).

Unit 9: Least square method **2 LHs**

Introduction to least square method, Line of best fit (two variables only), Measurement of trends, Method of least square for time series analysis.

References

Anthony Martin and Biggs Norman, ***Mathematics for Economics and Finance: Methods And Modelling***, Cambridge University Press.

Bradley Teresa, ***Essential Mathematics for Economics and Business*** 4th Edition, Wiley.

Brechner Robert, ***Contemporary Mathematics for Business and Consumers***, Thomson South-Western.

Dowling Edward, ***Schaum's Outline of Mathematical Methods for Business and Economics***, McGraw-Hill.

George B. Thomas and Ross L. Finney, ***Calculus with Analytic Geometry***, Addison – Wesley, 9th Edition.

Rosser Mike and Lis, Piotr, ***Basic Mathematics for Economists*** 3rd Edition. Routledge.

Taro Yamane, ***Mathematics for Economics***, Prentice-Hall of India, New Delhi, 2nd Edition (An Elementary Survey).

Wegner Trevor***, Applied Statistics: Methods and Excel-Based Application***, Juta Academics.