



ENGINEERING MATHEMATICS - I

PROF. JITENDRA KUMAR

Department of Mathematics
IIT Kharagpur

INTENDED AUDIENCE : All branches of science and engineering

COURSE OUTLINE :

This course is about the basic mathematics that is fundamental and essential component in all streams of undergraduate studies in sciences and engineering. The course consists of topics in differential calculus, integral calculus, linear algebra and differential equations with applications to various engineering problems. This course will cover the following main topics: Mean Value Theorems; Indeterminate Forms; Taylor's and Maclaurin's Theorems. Partial Derivatives; Differentiability; Taylor's Expansion of Functions of Several Variables. Maxima and Minima. Improper Integrals. Differentiation under Integral Sign (Leibnitz rule). Multiple Integrals and their Properties. Applications of Multiple Integrals. System of Linear Equations. Vector Spaces; Basis and Dimension of a Vector Space. Rank of a Matrix and its Properties. Linear Transformation. Eigenvalues and Eigen vectors. Diagonalization . First Order Differential Equations. Higher Order Differential Equations with Constant Coefficients. Cauchy-Euler Equations.

ABOUT INSTRUCTOR :

Prof. Jitendra Kumar is an Associate Professor at the Department of Mathematics, IIT Kharagpur. He completed his M.Sc. in Industrial Mathematics from IIT Roorkee and Technical University of Kaiserslautern, Germany in 2001 and 2003, respectively. He received his PhD degree in 2006 from Otto-von-Guericke University Magdeburg, Germany. He was Research Associate at the Institute for Analysis and Numerical Mathematics, Otto-von-Guericke University Magdeburg, Germany from 2006 to 2009. Dr. Kumar is the recipient of several recognized awards and fellowships, including Alexander von Humboldt fellowship, DAAD & DGF scholarships. His research interests include Numerical solutions of integro-differential equations, numerical analysis and modelling and simulations of problem in particulate systems.

COURSE PLAN :

Week 1: Differential Calculus - Functions of One Variable

Week 2: Partial Derivatives

Week 3: Total Differential and Differentiability

Week 4: Taylors Expansion of Functions. Maxima and Minima

Week 5: Improper Integrals

Week 6 : Double Integrals

Week 7 : Multiple Integrals & their Applications

Week 8 : System of Linear Equations - Gauss Elimination. Vector Spaces

Week 9 : Linear Transformations

Week 10 : Eigenvalues and Eigenvectors, Diagonalization

Week 11 : First Order Differential Equations

Week 12 : Higher Order Differential Equations with Constant Coefficients