



## MATHEMATICS

**PROF. JITENDRA KUMAR**

Department of Mathematics  
IIT Kharagpur



**TYPE OF COURSE** : New | Core | UG  
**INTENDED AUDIENCE** : All branches of science  
and engineering

**COURSE DURATION** : 12 weeks (28 Jan'19- 19 Apr'19)

**EXAM DATE** : 27 April 2019

### 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.

1. 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
2. Improper Integrals. Differentiation under Integral Sign (Leibnitz rule). Multiple Integrals and their Properties. Applications of Multiple Integrals
3. System of Linear Equations. Vector Spaces; Basis and Dimension of a Vector Space. Rank of a Matrix and its Properties. Linear Transformation. Eigenvalues and Eigenvectors. Diagonalization
4. First Order Differential Equations. Higher Order Differential Equations with Constant Coefficients. Cauchy-Euler Equations. System of Differential Equations

### ABOUT INSTRUCTOR :

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. His research interests include Numerical Solutions of Integro-Differential Equations and numerical analysis.

### COURSE PLAN :

- Week 01** : Differential Calculus - Functions of One Variable
- Week 02** : Partial Derivatives
- Week 03** : Total Differential and Differentiability
- Week 04** : Taylor's Expansion of Functions. Maxima and Minima
- Week 05** : Improper Integrals
- Week 06** : Multiple Integrals & their Applications
- Week 07** : System of Linear Equations - Gauss Elimination. Vector Spaces
- Week 08** : Linear Transformations
- Week 09** : Eigenvalues and Eigenvectors, Diagonalization
- Week 10** : First Order Differential Equations
- Week 11** : Higher Order Differential Equations with Constant Coefficients
- Week 12** : System of Differential Equations