PRE-REQUISITES : Engineering Mathematics - I

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 complex analysis, numerical analysis, vector calculus and transform techniques with applications to various engineering problems.

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. 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: Vector and scalar fields. Limit, continuity, differentiability of vector functions. Directional derivative, gradient, curl, divergence
Week 2: Line and surface integrals, Green, Gauss and Stokes theorem.
Week 3: Function of complex variables and their properties including continuity and differentiability. Analytic functions and CR equations, Line integrals in complex plane.
Week 4: Cauchy’s integral theorem, Power series, radius of convergence. Taylor’s and Laurent’s series, zeros and singularities, residue theorem
Week 6: Numerical integration. Solution of algebraic and transcendental equations.
Week 7: Laplace transform and its properties. Laplace Transform of special function.
Week 9: Fourier series and its convergence.
Week 10: Fourier integral representation
Week 12: Applications of Fourier series to boundary value problems.