

IIT Faculty Name: Prof. C. Vijayan, IITM

Topic Name: Gradient, Divergence and Curl

Relevant Course Name: Engineering Physics

Relevant Department: PHYSICS

Relevant Semester: First and Second Semester of B.E./B.Tech., Third and Fourth semesters of B.Sc.

Topic Description and Outline:

The mathematical concepts of gradient, divergence and curl form the basics of vector calculus and have relevance to several scientific and engineering applications, as they are useful in describing physical phenomena and processes in a concise manner. They provide a convenient toolbox and formalism to understand and analyze different aspects of dynamics including fluid dynamics and transport phenomena such as particle diffusion, flow of electricity, heat and viscosity. While taught as a part of a mathematics course, students generally find it difficult to grasp the physical meaning of these topics and are often unable to connect properly with the relevance of these concepts to engineering applications. These lectures address this issue precisely, by providing mathematical definitions, physical examples and training to work out problems related to physics and engineering.

Pre- requisites: Working knowledge and familiarity with elementary calculus and vector analysis; it is desirable to have exposure to partial derivatives and Cartesian and polar coordinate systems.