ICTS Lectures

Title : Perturbation methods for nonlinear PDEs

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Date : 01/05/2019 (Lecture 1)
03/05/2019 (Lecture 2)
07/05/2019 (Lecture 3)
08/05/2019 (Lecture 4)

Time : 11:00 AM – 12:45 PM

Venue: : Madhava Lecture Hall, ICTS Campus Bangalore

Abstract : Though the linear theory of equations (differential or otherwise) is well developed, the same is not the case for nonlinear equations. As one often does when holding a hammer, all problems are viewed as nails and so we adapt our ideas for linear equations in the context of nonlinear ones. In essence, this is what all perturbation methods do.

In this set of lectures, I'll introduce ideas that go by various names: perturbation methods, method of multiple scales, asymptotic analysis. The main goal will be to show how the one idea gets reused in numerous contexts allowing us to club seemingly disparate ad hoc methods into a unified approach. Along the way, we will also see the beautiful interplay between linear waves and nonlinearity. I will assume minimal knowledge (not more than a familiarity with linear algebra) and explain via examples coming from cold atoms, water waves and atmospheric science.