ICTS Skype Seminar

Title : New frontiers in applied complex analysis: compressible flows and vortex dynamics

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Date : Friday, December 29, 2017

Time : 3:00 PM

Venue : Amal Raychaudhuri Meeting Room, ICTS Campus, Bangalore

Abstract : The vorticity equation for two dimensional inviscid fluid flow offers a powerful and completely equivalent description of the Euler equation. Several models of vorticity, most notably point vortices have been studied extensively when the flow is incompressible. For compressible flows, point vortex models are thought to fail owing to regions of negative density in the flow domain. Finite-area vortices are a natural object to study in compressible vortex dynamics. In stark contrast to the incompressible case, the theory of compressible vortex dynamics is virtually non-existent. In this talk we discuss the extension of the classical incompressible Kármán vortex street solution to the compressible case both in the case of point vortices and in the case of finite-area vortices. We combine non-analytic function theory, perturbation theory and conformal mapping methods to obtain solutions for this weakly compressible flow. For the case of the finite-area vortices special functions known as the Schottky-Klein prime functions defined on 'circular domains' are utilised. Applications of the methods used here to other problems in multiply connected geometries such as Hele-Shaw flows will be touched upon.