National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Transpiration-induced flow of Special third-grade fluid under uniform shear with heat and mass transfer
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Supervisor	: Prof. Bikash Sahoo
Venue	: Seminar Room, Department of Mathematics
Date and Time	: 14 Jul 2025 (05:00 PM)
Abstract	: The presented work explores how transpiration alters the dynamics of special third-grade fluid flow over a stretching or shrinking surface under uniform shear flow. The mathematical formulation of the problem leads to a set of nonlinear partial differential equations, which are transformed into a system of coupled ordinary differential equations using Lie group analysis and appropriate similarity variables. The resulting system is solved numerically using the boundary value problem solver available in MATLAB. Dual solutions are identified for specific ranges of the stretching/shrinking parameter. The sheet's skin friction coefficient, heat, and mass transfer rate are evaluated with respect to various physical parameters. The findings reveal that dual solutions bifurcate from a critical point, below which no physical solution exists. A stability analysis is conducted to determine which of the dual solutions is stable by examining the sign of the smallest eigenvalue. The smallest eigenvalues are computed numerically, indicating that the upper solution branch is stable. Hence, the characteristics of the upper branch are relevant for describing the physical flow behaviour.