National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: A numerical framework for differential equations with arbitrary-order derivatives and nonlocal boundary conditions
Speaker	: Shubham Yadav (Rollno : 523ma1003)
Supervisor	: Jugal Mohapatra
Venue	: Seminar Room, MA dept
Date and Time	: 08 Sep 2025 (11. 00 AM)
Abstract	: This work investigates a class of boundary value problems involving multiple Caputo-type fractional derivatives and nonlocal integral boundary conditions. A finite difference scheme is developed to obtain numerical solutions, employing the L1 and L2 schemes for Caputo derivatives of arbitrary orders lie between (0,1) and (1,2). The nonlocal boundary integrals are approximated using the composite trapezoidal rule. Existence and uniqueness properties of the solution are established, and a detailed error analysis confirms that the scheme achieves first-order convergence. The effectiveness of the proposed method is demonstrated through numerical experiments. Additionally, Richardson extrapolation is applied to enhance the accuracy of the numerical approximations. The results highlight the robustness and efficiency of the method for solving fractional differential equations with nonlocal boundary conditions.