INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study	:	**Dual (M.Tech + Ph.D.)**

Thesis Title: **Wake Characterization of Small Horizontal-Axis Wind Turbines in Single and Double Rotor Systems**

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SHORT ABSTRACT

The present work investigated the wake dynamics of small horizontal-axis wind turbines operating under low tip-speed-ratio and low Reynolds-number conditions. The study focuses on two types of turbine configurations: single-rotor and double-rotor (side-by-side). To investigate wake structure, interaction, and recovery behavior relevant to small wind turbines and multi-rotor systems, a combined theoretical and experimental approach is employed. Wind tunnel experiments are conducted using scaled turbine models, with hot-wire anemometry used to resolve velocity deficiencies in both horizontal and vertical planes for different inflow velocities and rotor tip spacings. The results show that closer rotor spacing intensifies near-wake interaction, promotes early wake merging, and leads to irregular recovery, while wider spacing preserves wake symmetry and enables smoother downstream recovery. It has been demonstrated that low tip speed ratio operation has a significant impact on turbulence characteristics and wake evolution. The findings provide physically grounded insights into wake behavior at small scales and offer guidance for spacing optimization and performance improvement in small-scale and multi-rotor wind energy systems.