ALL ARE WELCOME

Ph.D. Seminar Talk 2

Title: **Energy-based analytical model for predicting instantaneous spread during droplet impact onto a heated substrate**

Speaker: **Mr. Pritam Kumar Singh (ME19D058)**

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Date and Time: **18-02-2026 (Wednesday) at 3:00 PM**

Venue: **meet.google.com/nmd-yrun-ywd**

Abstract

When a droplet impacts on a heated surface, the heat transfer can alter the thermo-physical properties of the liquid. This study examines the effect of such heat transfer on the spreading of the droplet. The Weber numbers encountered in this study ranges between 197–604, and the substrate temperatures between 25–200°C. The results show that the heat transfer has little influence on early impact dynamics but becomes considerable later, mainly in the viscosity-dominated phase. Post-impact droplet profiles at different temperatures show that droplet shapes at various times collapse onto a single curve in all cases, indicating a self-similar velocity field during the initial phase, unaffected by thermal effects. The droplet also undergoes a significant early-stage energy dissipation, which is independent of the substrate temperature. To quantify the effect of heat transfer on the later phases of droplet spreading, an energy-balance-based model was developed, incorporating the effect of heat transfer through the droplet's thermophysical properties. The model was validated against experiments, showing an overall good agreement with the instantaneous spreading of the droplet.