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M.S. Seminar Talk

Title: **A modelling approach to simulate binder-melt effects in composite solid propellant combustion**

Speaker: **Mr. Siddhaarth (ME22S097)**

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Date and Time: **12-03-2026 @ 3:00 PM**

Venue: **NAC-2 Room # 228**

Abstract

Modelling the combustion phenomena in composite solid propellants is essential for the prediction of ballistic characteristics; namely the burn rate and pressure index. One such modelling approach is the Heterogeneous Quasi One-Dimensional (HeQu1D) model, which accounts for the influence of propellant heterogeneity and extinction phenomena on the chemical kinetics and flame structure over the propellant surface. The model has demonstrated excellent predictive capability when applied to AP-HTPB composite propellants of solid loading > 85%. However, the model needs to account for binder-melt effects in order to accurately predict burn rate variations in relatively low solid loading AP-HTPB propellants. The current work aims to extend the HeQu1D framework to simulate binder-melt effects for improving the accuracy of the predictions. Additionally, the effect of binder modifiers, which influence the thermophysical properties of the binder-melt, is also incorporated into the model. The revised HeQu1D model sets the premise for predicting plateau and mesa burning regimes in propellant formulations whose combustion is primarily governed by the interaction of binder-melt with the oxidizer particles.