

**ALL ARE WELCOME**

**M.S. Seminar Talk**

Title: **On the possible adaptive thermal comfort with ceiling fan and exhaust fan for different climatic zones of India**

Speaker: **Mr. Trino Thomas (ME22S002)**

**M.S. Research Scholar for the Department of Mechanical Engineering, IIT Madras.**

Date and Time: **19-05-2026 @ 3:00 PM**

Venue: **Online**

**Link: <https://meet.google.com/vnw-cxhp-egn>**

### **Abstract**

The integration of energy-efficient solutions remains an essential hurdle in the pursuit of sustainable and comfortable indoor settings. As building energy consumption continues to climb, there is an urgent need to implement methods that reduce environmental effects, and at the same time, maintain adequate thermal comfort for occupant well-being and productivity. Ceiling fans, a standard fixture in many indoor settings, have gained popularity for their ability to provide better air movement and temperature adjustment while using substantially less energy than standard HVAC systems. A detailed literature review indicates a lack of 3D CFD study comparing ceiling fans and exhaust fans across different climatic zones of India and also a scarcity of studies with regard to a comparison between the energy loads associated with fan-based adaptive thermal comfort and air-conditioning.

This work presents a 3D Computational Fluid Dynamics (CFD) investigation of thermal comfort that can be achieved with a ceiling fan and an exhaust fan. A 3D fan zone model available in ANSYS Fluent was used to model the ceiling fan, considering the ceiling fan as a solid disc. Numerical methodology has been validated by verifying the transient simulation results against the experimental data available in the literature. The work analyzes thermal comfort parameters - temperature and velocity - in a room with a typical ceiling fan or an exhaust fan available in India. The study assesses thermal comfort using Tropical Summer Index (TSI) and Predicted Mean Vote (PMV). The results are presented for both summer and winter and for different climatic zones of India. The results show that the thermal comfort obtained with the exhaust fan is better than that with the ceiling fan for the evening, night, and early morning. A comparison with the literature results for air-conditioning load shows that fan-based (ceiling fan and exhaust fan) adaptive thermal comfort deliver substantial energy savings ranging from 83.9% to 94.6% relative to air-conditioning systems, at the instances where TSI values are neutral (within the adaptive thermal comfort range).