# CERTIFICATE Of PARTICIPATION

## Fares Khalfallah

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| **PAPER TITLE** | *Analysis of Heat Transfer by Mixed Convection in a Ventilated Cavity Filled with Hybrid Nano-Fluid: A Numerical Approach* |
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# ICAENS 2024

## 6th International Conference on Applied Engineering and Natural Sciences ICAENS 2024

September 25-26, 2024: Konya, Turkey

Abstract Book

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# Analysis of Heat Transfer by Mixed Convection in a Ventilated Cavity Filled with Hybrid Nano-Fluid: A Numerical Approach

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***Abstract –*** In this numerical study, the focus was on analyzing the heat transfer by mixed convection in a ventilated cavity filled with a hybrid nano-fluid. The hybrid nano-fluid consists of nano-particles (copper (Cu) and alumina ($Al_2O_3$)) dispersed in a base fluid (water). The volume fraction of nano-particles is 4 %. The cavity housed a cold cylinder at its center and incorporated two gates (orifices) for the influx and efflux of the flow., with a fixed Reynolds number ($R_e$) and varying Richardson numbers ($R_i$) set at 0.1, 1, 10, and 100. The cavity was subjected to isothermal heating by a heat source on the lower wall to maintain a constant temperature, while the remaining walls were kept adiabatic. The ventilated cavity is subjected to mixed convection, where both natural convection and forced convection effects are considered. The governing equations for the stationary laminar flow were solved numerically using the finite volume method. The numerical results revealed the significant impact of $R_i$ on heat transfer within the ventilated cavity. Consequently, the heat transfer rate (expressed by Nusselt number $N_u$) demonstrated an upward trend with increasing $R_i$ values. Overall, the results of this study were provide valuable insights for understanding the behavior and performance of systems that utilize hybrid nano-fluids in applications such as microelectronics cooling, heat exchangers, and energy storage devices.

*Keywords – Heat transfer, Mixed convection, Ventilated cavity, Hybrid nano-fluid, Richardson number*