International Conference on Latest Trends in Science, Engineering, Management and Humanities (ICLTSEMH -2025)
19th January, 2025, Noida, India.

CERTIFICATE NO : ICLTSEMH /2025/C0125255

A Bioconvective Study of Second Grade Nanofluid Over Elongated Sheet

Afsar Hossain Sarkar

Research Scholar, Ph. D. in Mathematics, Dr. A.P.J. Abdul Kalam University, Indore, M.P., India.

ABSTRACT

The bioconvective study of second grade nanofluid over an elongated sheet has gained considerable importance in recent years due to its wide applications in bio-microsystems, thermal engineering, and industrial processes. A second grade nanofluid, which incorporates the viscoelastic properties of non-Newtonian fluids along with the enhanced thermal conductivity of nanoparticles, provides a more accurate model for analyzing transport phenomena in complex environments. When this fluid flows over an elongated sheet, the interaction of nanoparticles with motile microorganisms generates bioconvection, enhancing the fluid stability and heat transfer characteristics. Such a study is significant in optimizing biomedical devices, cooling systems, and fermentation technologies where controlled heat and mass transfer are crucial. The elongated sheet model helps in understanding the boundary layer behavior, velocity distribution, thermal gradients, and nanoparticle concentration influenced by bioconvective forces. Furthermore, incorporating motile microorganisms into the fluid prevents nanoparticle agglomeration, maintaining uniform dispersion and stability of the nanofluid. These findings are particularly relevant for applications involving drug delivery, nanomedicine, and biotechnology, where precise regulation of temperature and concentration is essential. Overall, investigating the bioconvective flow of second grade nanofluid over elongated sheets offers deeper insights into non-Newtonian transport mechanisms with strong potential for scientific and industrial advancements.