Notice for the PhD Viva Voce Examination

Ms Richa Saha (Registration Number: 1942073), PhD scholar at the School of Sciences, CHRIST (Deemed to be University), Bangalore will defend her PhD thesis at the public viva-voce examination on Tuesday, 23 May 2023 at 10.00 am in the Council Room, Ground Floor, Central Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	**:**	**Dynamics of Newtonian Fluids and Nanofluids in Various Geometries**
Discipline	**:**	**Mathematics**
External Examiner (Outside Karnataka)	**:**	**Dr Ravi Ragoju** Associate Professor Department of Applied Sciences National Institute of Technology Farmagudi, Ponda – 403401 Goa
External Examiner (Within Karnataka)	**:**	**Dr B M Shankar** Associate Professor Department of Science and Humanities PES University, Bengaluru - 560085 Karnataka
Supervisor	**:**	**Dr Smitha Saklesh Nagouda** Associate Professor Department of Mathematics School of Sciences CHRIST (Deemed to be University) Bengaluru - 560029 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Registrar

Place: Bengaluru
Date: 15 May 2023

ABSTRACT

The study of fluid motions and heat transfer has long been motivated by important applications in the industry and in nature. In most geophysical phenomena, fluid flows are maintained by buoyancy forces. The main interest in the study of stability of natural convection in a fluid layer is to know when and how laminar flow breaks down, its subsequent development and its eventual transition to turbulence. Natural convection of a viscous fluid in a vertical layer, where the wall is held at different temperatures, provides one such simple case of an interaction between buoyancy and shearing forces. Additionally, the convective flow of a fluid over an undulated horizontal surface presents a case of non-idealistic fluid motion where the undulations tend to modify the nature of the flow as well as affect the heat transfer in the fluid as a whole. To model these practical phenomena and to the analyze fluid motions arising therein has been the main objective of this research work. In this thesis, the boundary-layer flows of Newtonian fluids in different geometries – primarily, a horizontal surface and a vertical surface. To account for the imperfections arising in realistic scenarios, we have considered a horizontal surface with undulations and a vertical surface with a non-uniform temperature distribution. Additionally, it is well-known that to meet the cooling rate requirements in the industry, the thermal performance of ordinary heat transfer fluids is not suitable. The concept of insertion of nanometre-sized metallic particles in the fluid leads to an increase in the thermal conductivity of the ordinary base liquids. Therefore, to fully comprehend the affect of these nanoparticles on the onset of convection and fluid motions and to assess how the enhanced thermophysical properties may affect the heat transfer is another key objective of this research.

Keywords: undulated surfaces, periodic temperature variation, boundary-layer flow, heated vertical surface, Keller-Box method, partial differential equations, finite difference method, nanofluids, nanoparticle, water-copper nanofluid, hybrid-nanofluid

Publications:

1. P. G. Siddheshwar, Mahesha Narayana, **Richa Saha** and Smita S. Nagouda, "A Comparative Study of Thermoconvective Flows of a Newtonian Fluid Over Three Horizontal Undulated Surfaces in a Porous Medium", *Journal of Heat and Mass Transfer - Transactions of the ASME*, vol. 144, no. 9, p. 092701, 2022. https://doi.org/10.1115/1.4054803
2. **Richa Saha**, Mahesha Narayana, P. G. Siddheshwar and Smita S. Nagouda, "Thermo-convective flows of mono- and hybrid-nanofluids over horizontal undulated surfaces in a porous medium", *Journal of Nanofluids*, vol. 12, no. 2, pp. 514–534, 2023. https://doi.org/10. 1166/jon.2023.1920
3. Mahesha Narayana, **Richa Saha**, P. G. Siddheshwar and Smita S. Nagouda, "Thermo-Convective Flows of Mono-and Hybrid-Nanofluids Over Horizontal Undulated Surfaces in a Porous Medium", *Journal of Heat and Mass Transfer - Transactions of the ASME*, vol. 145, no. 7, p. 072601, 2023. https://doi.org/10.1115/1.4056922
4. **Richa Saha**, Smita S. Nagouda, "The effect of various nanoparticle shapes on the thermoconvective flow of a mono-nanofluid along a vertical surface subjected to periodic temperature variations", communicated to *ZAMM*.