CHRIST
(DEEMED TO BE UNIVERSITY)
BANGALORE | DELHI NCR | PUNE

Notice for the PhD Viva Voce Examination

Ms Davita Devi Soibam, Registration Number: 2170211, PhD Scholar at the Department of Mathematics, School of Sciences, CHRIST (Deemed to be University) will defend her PhD thesis at the public viva-voce examination on Monday, 05 January 2026 at 2.00 pm in Room No. 044, Ground Floor, R&D Block, CHRIST (Deemed to be University), Bengaluru - 560029, Karnataka, India.

Title of the Thesis	:	**Weakly Nonlinear Stability Analysis of Darcy-Bénard Convection: Effects of Free Surface and Convective Boundary Conditions**
Discipline	:	**Mathematics**
External Examiner - I	:	**Dr P V S N Murthy** Professor Department of Mathematics Indian Institute of Technology Kharagpur Paschim Medinipur West Bengal - 721302
External Examiner - II	:	**Dr Rushi Kumar B** Professor Department of Mathematics Vellore Institute of Technology Vellore - 632014 Tamil Nadu
Supervisor	:	**Dr Pradeep G Siddheshwar** Senior 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: 01 January 2026

ABSTRACT

Investigating buoyancy-driven natural convection, where temperature gradients generate fluid movement, enhances our understanding of the fundamental mechanisms governing heat and mass transfer in fluids. Darcy-Bénard convection (DBC) exhibits various instability modes depending on parameters such as Rayleigh number. Analyzing flow behavior helps in predicting these instability modes (onset of chaotic behavior), which is crucial for maintaining system stability or triggering controlled mixing in industrial processes. This thesis investigates the weakly nonlinear stability analysis of Darcy-Bénard convection in a rectangular enclosure with convective boundary conditions applied at the top surface. Both linear and weakly non-linear analyses are performed to gain insights into regular convection patterns, heat transport behavior, and the onset of chaotic motion. A Lorenz model is utilized to explore both steady and unsteady states associated with non-classical Darcy-Bénard convection. To assess the enhancement in heat transfer, the Nusselt number is evaluated. The impact of viscous dissipation on non-classical Darcy-Bénard convection is also analyzed in detail.

Keywords: *Darcy-Bénard convection, rectangular enclosure, convective boundary conditions, Fourier-Galerkin, Maclaurin series, Lorenz system, heat transport, chaos, viscous dissipation.*

Publications:

1. P.G. Siddheshwar, **Davita Devi Soibam**, and Laroze D, "Study of chaos in the Darcy-Bénard convection problem with Robin boundary condition on the upper surface", Physics of Fluids, vol. 36, 2024. https://doi.org/10.1063/5.0180488.
2. **Davita Devi Soibam**, and P.G. Siddheshwar, "Analogy between Darcy-Bénard convection problems involving a clear fluid and a nanofluid: An illustration", Advancements in Nanotechnology for Energy and Environment, pp. 185-198, Springer Nature, Singapore, 2022. https://doi.org/10.1007/978-981-19-5201-2_10.
3. **Davita Devi Soibam**, P.G. Siddheshwar, and Ruwaidiah Idris, "Comparison of the results of steady Darcy-Bénard convection problems of the classical and the Barletta types", CFD Letters, pp. 163-177, Semarak Ilmu Publishing, 2025. https://doi.org/10.37934/cfdl.17.9.163177.