Abstract of Ph.D Thesis (Mathematics)

FLOWS OF NANOFLUIDS PAST PLATES AND IN CHANNELS

Ms. Neethu T S
Research Scholar
Department of Mathematics
St. Thomas College (Autonomous), Thrissur

Dr. Alphonsa Mathew
Research Guide & Assistant Professor
Department of Mathematics
St. Thomas College (Autonomous), Thrissur

The present thesis is attentive towards the numerical investigation of viscous incompressible nanofluid flow past plates and in channels in the presence of an applied magnetic field under different conditions. Tiwari-Das nanofluid models are employed to describe fluid motion. This thesis is arranged into six chapters in which ***Chapter 1*** is an introductory one that contains some basic concepts, preliminaries and background of the work. A review of relevant literature has also been included.

Chapter 2 investigates the magnetohydrodynamic flow of water-based nanofluids between two oppositely moving vertical porous plates. The perturbation technique is used to solve the governing equations of the flow. The consequence of various parameters on velocity, temperature, and concentration are examined via graphs utilizing MATLAB software. The physical quantities are scrutinized using statistical tools like probable error and multiple linear regression and an excellent agreement is noted.

Chapter 3 explores the three-dimensional convective hydromagnetic hybrid nanoliquid (with suspended Al_2O_3 and Fe_3O_4 nanoparticles) flow between two oppositely moving vertical porous plates utilizing Perturbation technique. The consequence of effectual parameters on the flow profiles are analyzed with the aid of graphs using MATLAB software. Further, rate of heat transfer is statistically scrutinized utilizing RSM (Response Surface Methodology) and sensitivity analysis. Moreover, this study finds applications in several engineering, geophysical, and industrial fields like in heat exchangers and faulting.

Chapter 4 includes a theoretical investigation of bioconvective electromagnetohydrodynamic (EMHD) hybrid nanofluid (water-based $CNT - Fe_3O_4$) over a stretching surface. The impact of viscous dissipation, chemical reaction, and stratification is also explored in it. The present study finds application in cancer therapy, bio-microsystems, biomedical imaging, and therapeutic drug delivery.

Chapter 5 analyses the magnetohydrodynamics of bioconvective hybrid nanofluid (water-based $TiO_2 - Ag$) flow over a permeable exponential stretching sheet. The effects of thermal radiation, heat generation, chemical reaction, porosity, and viscous dissipation have been incorporated. Further, the drag coefficient and heat transfer rate are scrutinized using statistical techniques.

Chapter 6 presents the concluding remarks of the thesis and proposals for the future work. These studies find applications in biomedical field and industrial field.