World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:12, No:02, 2018

Similarity Solutions of Nonlinear Stretched Biomagnetic Flow and Heat Transfer with Signum Function and Temperature Power Law Geometries

Authors : M. G. Murtaza, E. E. Tzirtzilakis, M. Ferdows

Abstract : Biomagnetic fluid dynamics is an interdisciplinary field comprising engineering, medicine, and biology. Bio fluid dynamics is directed towards finding and developing the solutions to some of the human body related diseases and disorders. This article describes the flow and heat transfer of two dimensional, steady, laminar, viscous and incompressible biomagnetic fluid over a non-linear stretching sheet in the presence of magnetic dipole. Our model is consistent with blood fluid namely biomagnetic fluid dynamics (BFD). This model based on the principles of ferrohydrodynamic (FHD). The temperature at the stretching surface is assumed to follow a power law variation, and stretching velocity is assumed to have a nonlinear form with signum function or sign function. The governing boundary layer equations with boundary conditions are simplified to couple higher order equations using usual transformations. Numerical solutions for the governing momentum and energy equations are obtained by efficient numerical techniques based on the common finite difference method with central differencing, on a tridiagonal matrix manipulation and on an iterative procedure. Computations are performed for a wide range of the governing parameters such as magnetic field parameter, power law exponent temperature parameter, and other involved parameters and the effect of these parameters on the velocity and temperature field is presented. It is observed that for different values of the magnetic parameter, the velocity distribution decreases while temperature distribution increases. Besides, the finite difference solutions results for skin-friction coefficient and rate of heat transfer are discussed. This study will have an important bearing on a high targeting efficiency, a high magnetic field is required in the targeted body compartment.

Keywords : biomagnetic fluid, FHD, MHD, nonlinear stretching sheet
Conference Title : ICAM 2018 : International Conference on Applied Mathematics
Conference Location : Bangkok, Thailand
Conference Dates : February 08-09, 2018