Abstract

The instantaneous rate of change of the output as the input level changes is studied in classical calculus. As a result, it is unable to take into account the memory effect or past state of the system. Yet, in fractional calculus, the rate of change is influenced by each point of the interval under consideration, allowing for the incorporation of any system's prior memory effects. Because of this, the order of a fractional derivative is utilised as a memory index in the contemporary definition of fractional derivatives (with singular and non-singular kernels).

This thesis is centred on a comparative investigation of derivatives of fractional orders, specifically the Caputo, Caputo-Febrizio and Atangana-Beleanu Caputo derivatives. The current work involves free convective MHD flow of fractional Jeffrey fluid. The fractional derivatives have been established as the mathematical model for governing fluid flow. Numerical inversion algorithms and the Laplace transform have been used to solve the resulting model. By graphical representations of the fluid flow, the effects of slip, no-slip, magnetic field, fractional parameter and other rheological factors are also examined.