From the Guest Editors

NEW TRENDS IN FRACTIONAL MODELLING OF TRANSPORT PROBLEMS IN FLUID MECHANICS AND HEAT MASS TRANSFER

Transport phenomena form a broad area of applications of modelling techniques especially when fluid and heat flow are involved. Commonly local (integer order) derivative are used in models, but with deficiencies to model relaxation processes in new materials and effects of memory. In such cases fractional operators (derivatives and integral) with different memory kernels are useful tools for modeling such complex processes.

Fluid flow with or without accompanying mass or heat transfer, attains almost all aspects of the natural and engineering world, and thus is of interest to engineers, mathematicians, physicists, and biologists. It contains an implausibly extensive range of scales from flows in biological cells, technological processes, natural flows in seas and rives and convective flows in stars. There is the miraculousness of turbulence in fluid flows. The methods to model transport problems involving fluid flow with heat and mass transfer have evolved over time, initially being mostly mathematical with strong idealizations of the real problems. General attributes of the main set of fluid mechanics equations, for example, accepted for describing fluid flows are analyzed considering the compatibility condition. Fractional calculus performs an important role in the fields of mathematics; physics, electronics, mechanics, and engineering in recent years. The methods of this type of calculus are continuously generalized and enhanced especially during the last few decades. Many operations in physics and engineering can be defined accurately by using systems of differential equations containing different type of fractional derivatives.

The collection of research results published in this supplement contains 38 high quality papers by prestigious authors deeply involved in modelling by fractional calculus tools of problems emerging in fluid mechanics as well as heat and mass transfer.

The collection includes reports on applications of some new techniques for solutions of were still open problems, among them:

- *Three-dimensional Hausdorff derivative diffusion model for isotropic/anisotropic fractal porous media*
- *On numerical solutions for the Caputo-Fabrizio fractional heat-like equation, fractal derivative*
- *Fractal derivative model for the transport of the suspended sediment in unsteady flows*
- *A modification fractional variational iteration method for solving non-linear gas dynamic and coupled KdV equations involving local fractional operators*
- *A heuristic optimization method of fractional convection reaction: An application to diffusion process*
- *Analytic approximate solutions for fluid-flow in the presence of heat and mass transfer*

– *The reduced differential transform and variational iteration methods for 3-D diffusion model in fractal heat transfer within local fractional operators*
– *Numerical solution of fractional order advection reaction diffusion equation*

We believe that the articles included in this supplement will allow speeding new results in ideas in the contemporary hot area of modelling involving fractional operators of different kind thus providing useful tools for solving actual engineering and physical problems.

Guest Editors

Prof. Dr. Mustafa Inc,
Department of Mathematics, Science Faculty,
Firat University, Firat, Turkey

Prof. Dr. Dumitru Baleanu
Department of Mathematics and Computer Sciences,
Faculty of Arts and Sciences
Cankaya University, Ankara, Turkey

Prof. Dr. Jordan Hristov,
Department of Chemical Engineering,
University of Chemical Technology and Metallurgy,
Sofia, Bulgaria