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| Title | Bio‑nanoconvective Micropolar Fluid Flow in a Darcy Porous Medium Past a Cone with Second‑Order Slips and Stefan Blowing: FEM Solution | | |
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| Published Journal Name | Iranian Journal of Science and Technology, Transactions of Mechanical Engineering | | |
| Type of Publication | Journal | | |
| Volume |  | Issue |  |
| Publisher | Springer | | |
| Publication Date | 20/03/2023 | | |
| ISSN | 2228-6187 | | |
| DOI | <https://doi.org/10.1007/s40997-023-00626-0> | | |
| URL | https://www.springer.com/journal/40997 | | |
| Other Related Info. |  | | |
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| Abstract |  |
| The current framework uses a theoretical and computational model based on both second-order momentum and temperature slips to simulate momentum, angular momentum, heat transport, nanoparticle volume fraction transport, and the density of microorganism transport phenomena past a cone located in a Darcy porous medium. These types of flows happen in typical nanodevice components such as nanocapillaries, nanovalves, nanorotors, and nanobearings and in low-pressure environments. With this in mind, the governing highly partial differential equations were converted to similarity ordinary differential equations via invariant transformations developed through Lie symmetry analysis before being simulated using the efficient finite element method. Tables and graphs illustrate the impact of emerging parameters on flow characteristics as well as heat, mass, and microorganism transfer rates. It is found that friction increases, while heat, mass, and microorganism transfer decrease with the micropolar parameter for both isothermal and non-isothermal cones. Friction decreases with the first-order thermal slip parameter in the absence of second-order slip, but it follows reverse behavior in the presence of second-order slip. Heat transfer rate decreases, while mass and microorganism transfer rates increase with the first-order thermal slip parameter when considering the second-order slip parameter. The decrement of 20% in maximum stream function is noticed if micropolar nanofluid (Δ=1Δ=1) is used instead of Newtonian nanofluid, which further regulates heat transfer significantly. | |