In this article, laminar mixed convective heat transfer at different nanofluids flow in an elliptic annulus with constant heat flux boundary condition has been numerically investigated. The three dimensional governing equations (continuity, momentum and energy) are solved using the finite volume method (FVM). The investigation covers Reynolds number and nanoparticle volume fraction in the ranges of 200–1000 and 0–4% respectively. In the present work, four different types of nanofluids are examined in which Al_2O_3, CuO, SiO_2 and ZnO are suspended in the base fluid of ethylene glycol (EG) with different nanoparticle sizes 20, 40, 60 and 80 nm. The results show that SiO_2-EG nanofluid has the highest Nusselt number, followed by Al_2O_3-EG, ZnO-EG, CuO-EG, and lastly pure ethylene glycol. The Nusselt number increased as the nanoparticle volume fraction and Reynolds number increased; however, it decreased as the nanoparticle diameter increased. It is found that the glycerine-SiO_2 shows the best heat transfer enhancement compared with other tested base fluids. Comparisons of the present results with those available in the literature are presented and discussed.